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ABSTRACT

This report describes the 3 years of operation of the Special Education Software Center (Menlo Park, California), implemented with federal funding by SRI International, LINC Resources Inc., and the Council for Exceptional Children. The report describes activities of the Center and portrays, from the patterns of information requests received by the Center, the software information needs of the special education community. Following an introductory section, Section II provides a brief background on technology and the handicapped, and describes the federal government's role in supporting the use of technology in special education. Section III presents the approach used in setting up the Center, describing the Center's overall design, development, and electronic network support; the section also discusses Center services, including technical assistance, software information, conferences, and assistance to the Model Secondary School for the Deaf. Section IV examines the Center's success in increasing the quantity and quality of microcomputer software applicable to special education and also in increasing its accessibility. A final section outlines lessons learned and recommendations. Notes, a bibliography, and exhibits are appended to the report. (JDD)

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THE SPECIAL EDUCATION SOFTWARE CENTER

FINAL REPORT

December 1987

Prepared for:

The Office of Special Education Programs
U.S. Department of Education

Contract No. 300-84-0146
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SRI International

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SUMMARY OF FINAL REPORT

Purpose: The purpose of the Center was threefold: (1) to provide software development technical assistance to special education personnel and others who were creating computer-assisted or managed instructional materials for administration of special education services; (2) to provide to special education personnel, parents of handicapped children, and others information concerning available microcomputer software useful in the instruction of handicapped children or in the administration of special education services; and (3) to convene periodic conferences for the purposes of improving the development of software and of improving services provided by the Center. The Center was based at SRI International. Two subcontractors--LINC Resources, Inc. and the Council for Exceptional Children--shared responsibility with SRI for critical tasks within the Center.

Results: As the Center developed, there was a relatively small number of users developing software who required programming assistance. The technical assistance that was provided to this group of users primarily involved the Center's preparation of subroutines which were sent to the requester and posted on the HelpNet bulletin board.

The information services of the Center focused on the needs of the remaining three groups of users. This information included information about available software, information about the special education market, and information related to understanding the needs and constraints of special education. The leading users of the information dissemination services of the Center were teachers and administrators. The largest number of requests were for software information to assist in the instruction of the learning disabled, mentally retarded, and physically handicapped. Information about software for teaching language arts was the type of information requested most often.

The first annual conference sponsored by the Center brought together educators administrators, parents, software developers and publishers, researchers, and policymakers, to share ideas, discuss needs, and advance the state of special education software. More than 500 participants attended that conference. At the request of the government, the Center reduced the size of the conference in Years 2 and 3, included a more even distribution of the categories of people attending, and encouraged fuller participation of industry representatives--particularly computer and peripheral companies. The participants in the second and third conferences were more evenly distributed between educators, and publishers and software developers. This balances as well as fewer participants promoted more discussion and interaction between the two groups.

During the Center's three years of operation, it focused on providing a specific body of information related to the software side of special education technology and did so efficiently with most inquiries handled routinely within 24 hours. Users also had direct access to the information service at no cost.

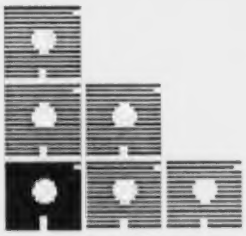
Implications: The following are some commonsense notions outlined in the report for national information dissemination. These are not unusual discoveries but some commonsense rules that sometimes get lost.

* Be very clear about what information can and cannot be provided. This also requires knowing your target audience.

* Valuable time can be saved if users also know up front what business you are in.

* Information must be up to date and applicable to target users' needs.

* Users should be referred to other resources when appropriate.



THE SPECIAL EDUCATION SOFTWARE CENTER

FINAL REPORT

December 1987

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SRI International

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FOREWORD

Dedication

This report is dedicated to handicapped students and to the many persons who used the Special Education Software Center to obtain or provide information—parents, teachers, administrators, health professionals, software developers, publishers and researchers. The number of people who used the center's services far exceeded our original projections, and their enthusiastic response to the help they received increased our understanding of the importance of our task.

Working Together For Success

The center was based at SRI International, but three contractors were responsible for critical tasks within the center—SRI, LINC Resources, Inc., and the Council for Exceptional Children. It is not always easy for contractors to work together smoothly toward a common goal for a prolonged period. They frequently have overlapping talents, and ways of addressing issues, and conflict is not uncommon. In the case of the Software Center, perhaps because the welfare of the handicapped students (the ultimate recipients of the center's services) was so important to us all, the contractors were unfailingly supportive of the center's goals and of each other, and our users had the full benefit of the expertise the three organizations represent. We particularly thank Marion Collins, Harold Huntley, John Rollin, William Ross, Mimi Stearns (the project supervisor), and Andrew Zucker, of SRI International; Charles Lynd, Linda Fuchs, and Carol Roddy of LINC Resources; and Ellen Peters, Trudy Kerr, and the late Herbert Prehm of the Council for Exceptional Children. All were important members of the center's project team.

We wish to thank our project monitor, Paul Andereck, of the Office of Special Education Programs in the U.S. Department of Education, for his leadership and counsel during our 3-year project. The concept of the technology-based software center was his, and we were pleased to bring his dream to reality.

Our thanks also to the members of our advisory boards who gave us so much of their time and contributed greatly to the success of our information services and annual conferences. The center would not have

been the success it was without the support we received from the private sector—from Tandy Corporation which was so generous in providing computers for running HelpNet and computers for our conferences; from IBM Corporation, which supplied the machine that supported the information database, and machines at our conferences; and from Apple Computer Inc., which supplied us with a computer for the project, computers for the conferences, and which helped distribute the center's brochures through its dealers.

The software publishers—DLM, Mindscape, Scott Foresman, The Learning Company, MECC, and Sunburst, to name just a few—were also unfailing in their support, the information they provided us, and the software they supplied for the conferences.

Finally, thanks to Klaus Krause, who not only edited the text of this report, but provided invaluable help and advice on its format and production.

I INTRODUCTION

What This Report Is About

This report describes the three years of operation of the Special Education Software Center. The center was a success beyond the hopes of its conceptualizers — the Office of Special Education in the U.S. Department of Education — and its implementers — SRI International, LINC Resources Inc., and the Council for Exceptional Children. By the close of the project more than 17,000 people had made use of the center's services, we hosted three conferences attended by developers and users of special education software, and we had provided more than 75,000 software information descriptions and responded to more than 6,000 technical assistance and general information requests.

The center can be counted a great success by other measures, too. One is the advancements it made in the means of providing information and technical assistance services. We were breaking ground in turning around information in a timely fashion, using traditional and new approaches. People reaching the center by mail or phone could reasonably expect a printed listing of the software information they had requested to be on its way to them within 48 hours receipt of request. Callers requiring technical assistance or other information often received help on-line from someone with the particular expertise they needed. In the final year of the project, users equipped with computers and modems could conduct their own on-line search of the database—needing no training and no knowledge of particular language or computer commands to gain immediate access to information. We were, in fact, a technology-based center that had learned to use its own technology successfully in aiding our clients.

This report provides a description of these activities and portrays, from the patterns of requests we received, the software information needs of the special education community. It presents the center's model for responding to those requests and provides recommendations for others who need to respond to these and other educational technology information needs in the future.

How This Report Is Structured

In Section II which follows this introduction, we provide a brief background on technology and the handicapped, and describe the federal government's role in supporting the use of technology in special education and the authorization for the center. Section III presents our method of approach for designing the center and implementing its activities, and some anecdotal comments by users concerning Center services. In Section IV we present results of the center's operations. Section V describes the lessons we have learned in designing and running a technology-based special education information center, and provides recommendations for similar operations. Numbered notes, a bibliography, and exhibits are appended to the report.

II BACKGROUND

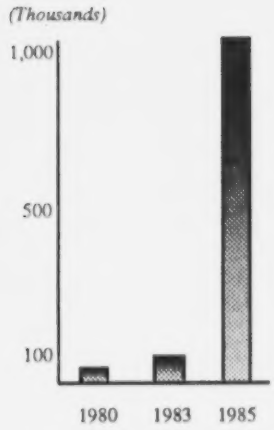
Technology and the Least Restrictive Environment

Technology's ability to ameliorate handicapping conditions has been dramatically demonstrated time and again this past decade. A student with cerebral palsy unable to communicate on his own, uses a computer that "speaks" for him as he types in his words; a blind student and her sighted friend, working together, check computer-generated writing from a printer that produces both braille and text; a profoundly deaf student, through computer instruction, learns language he has never heard and carries on electronic mail "conversations" with his friends.

One technology in particular, the microcomputer, through the software it drives and the peripherals it supports, has broadened the learning and living environments of many such handicapped students and has helped to create for them the "least restrictive environment" sought by Public Law 94-142, the Education for All Handicapped Children Act. Through speech synthesizers, headwands, expanded keyboards, single-switch devices, text scanners, automatic braillers, puff-straws and the like, the computer is able to reduce the restrictions and limitations of students' disabilities, freeing them to learn alongside their non handicapped peers.

Individualizing Education

But the microcomputer is capable of much more than providing the handicapped student with *access* to learning. It can, and should, support instructional software individualized according to each student's learning needs. It can also support administrative software to help teachers develop and monitor their students' individualized education programs. The delay in implementing these applications was one of the reasons the Special Education Software Center was funded. The reasons for the lag in production of effective instructional and administrative software for the special education community has its roots in the larger issue of how microcomputer technology has been implemented in education generally. The brief description provided below helps put into context the rationale for the formation of the Special Education Software Center.



Installed Microcomputers in Public Schools

Microcomputers and General Education

The microcomputer revolution was unique in educational history in that it was driven by (1) parents wanting to ensure that their children were well prepared for a world that is becoming increasingly technology oriented, (2) manufacturers and vendors who were anxious to open up new markets, and (3) school personnel and students who had bought and were using their own equipment. These groups put heavy pressure on a very conservative institution—the public school system. In 1980 approximately 35,000 microcomputers were installed throughout 80,000 schools; by 1983 the number had doubled; and in 1985 there were over 1 million being used in elementary and secondary schools.[1] School and district personnel found themselves confronted by a new technology without the preparation they needed to use it, and without instructional software designed to meet their objectives for students, or developed to complement their teaching.

But computers need software ...

Computers need software applicable to schooling and handicapping conditions to make them useful instructional tools that support teaching and learning. Software development was, and is, very costly. Software developers must look for markets of sufficient size to help defray their large initial investment in developing commercially viable products. In the education field such markets exist for the more generic education software such as management (e.g., student records, test generators) and tool (e.g., word processors, spreadsheet applications) software, but it was unclear in the early 1980s that they existed for instructional programs tailored to particular subject areas and grade levels—much less to educational disabilities. The result was that the production of high-quality instructional software lagged far behind management and tool software.

High-quality instructional software for *special education* purposes was almost non existent. Software developers and publishers had little confidence in the special education market, fragmented as it was by a variety of handicapping conditions and skill levels, and they were reluctant to develop software for such "thin", specialized markets. In addition, much of the courseware that had proven successful in the general education market at that time was inappropriate for the special education population. In 1983 Education Turnkey reported, "Of 538

software titles in three curriculum categories—reading and vocabulary, language arts, and learning and survival skills—only 125 were found to be appropriate for special education. In language arts only 15 of 143 titles were designed for special education."[2] The result of this situation was that much of the instructional software targeted for the special education population was being developed by interested individuals rather than by people specializing in software development. Although some of the programs were based on sound educational values and pedagogical principles, the software produced was frequently mediocre. Inexperienced developers rarely had advanced programming skills or training in using the full potential of the microcomputer. Those with advanced programming skills had little knowledge of needs of the users or the environment. Thus, there was a great need to encourage the development of *high-quality* programming specifically targeted to special education and to demonstrate the nature of the demand for such products.

Special Education's Information Needs

Compounding the problem of insufficient special education software was the lack of information about what was already available. There was no central information source to be tapped, and few teachers or parents of handicapped students knew what software was available or appropriate for individual needs. Keeping current with today's changing instructional technologies; understanding what software is available, what works with what hardware and peripherals, what is needed; and disseminating that information to the people who need it are monumental tasks that few education organizations are equipped to handle. The variety of handicapping conditions and the different needs of special education students add to the complexity of providing information on available instructional technology for handicapped students. Thus, there was identified a second important need—an information system about software that was appropriate for the education of handicapped students that would be useful for, and accessible by, everyone with a stake in special education.

The Federal Role

If market forces are not sufficient to make instructional materials and technologies available for equal opportunity and access to a quality education for handicapped students, the federal government can, and does, intervene. Part F of Public Law 91-230 authorizes initiatives that "increase the use of high quality and relevant instructional medium materials and technologies to meet the educational needs of handicapped children effectively."[3] By 1983 the areas of deficiency—the lack of high-quality software for special education and the lack of information

about software that was available—had been identified, and the Office of Special Education Programs funded an initiative to correct this situation. It was the Special Education Software Center project.

The Special Education Software Center

On October 13, 1983, the U.S. Department of Education issued a request for proposal for the formation of a center for technology software with the objective of improving the quality and availability of special education software. The proposed center was to:

- Provide technical assistance in microcomputer software development to special education personnel and others who create computer-assisted or -managed instructional materials for the education of the handicapped or who create computer programs useful in administration of special education services.

- Supply information to special education personnel and parents of handicapped children concerning available microcomputer software useful in the instruction of handicapped children or administration of special education services.

- Convene periodic conferences.

- Provide services to the Model Secondary School for the Deaf (housed at Gallaudet College in Washington, D.C.) and comply with other legally mandated requirements of this center.

On June 12, 1984, SRI International was awarded a 3-year contract to initiate and develop the Special Education Software Center. SRI put together the team of contractors it felt was most qualifed. SRI itself was to design and manage the national center overall, establish the electronic network system that supported it, and provide technical assistance to software developers. The software clearinghouse was to be managed by LINC Resources, which had already taken a leadership role in assembling a special education software database and had published a major catalogue of special education software. The Council for Exceptional Children, the principal advocacy organization for the handicapped in the nation, had broad experience in mounting special education conferences, and was to organize the annual software conference. Each entity had a great deal of experience in the area for which it was responsible.

Our goal: provide real service to real people in real time

The center provided us with a unique opportunity. We were the first in the nation to be responsible for creating such a center that would help especially those who needed it the most—educational practitioners, including individual parents, and their handicapped pupils—with the services they needed. We would be, in our words, providing real service, to real people in real time.

III APPROACH

In this section we describe the methods we used to set up the Special Education Software Center, including our overall design, center development, and the electronic network support. This is followed by a description of the methods we used for building awareness of the services the center provided and a description of the services themselves—technical assistance, software information, the annual conferences, and assistance to the Model Secondary School for the Deaf.

Designing The Center

Because the major obstacle to the successful use of technology in the education of handicapped students was the lack of high-quality educational software, we defined a number of interrelated purposes for the center. We had to:

- Help increase the quantity and quality of microcomputer software applicable to special education.
- Increase the accessibility of this software.
- Encourage the use of appropriate high-quality software in special education.

In creating the center, we thought in terms of building a model operation that should be usable or adoptable by the private sector, or by state departments of education and school districts. It was to be no easy task. We had to show high productivity at a reasonable cost, which meant keeping staffing (generally the most costly element in providing services) to a minimum and making effective use of technology.

We first established that the center's users grouped into four overlapping areas of interest. The first group was made up of special education teachers, administrators, and parents who do not develop software but who want to use it for instruction or management purposes. In the second group were teachers, administrators, parents, small software developers, and programmers in established firms who create software. The third group was composed of the publishers, vendors,

and suppliers responsible for producing and distributing software applicable to special education. The fourth group was made up of researchers, policymakers, and educators who were making major decisions about what software would be developed and purchased.

To serve this wide variety of users we established a center consisting of three components: technical assistance, a software clearinghouse, and a conference component. The center had to be easily accessed by users anywhere in the nation, who would receive its services free of charge and would be supported by an electronic communications system.We were also mandated to assist the Model Secondary School for the Deaf, and our assistance to them fell into the categories we had defined for other users.

Center Development

In developing the center, we saw ourselves as service providers. In the business world service providers must be sensitive to a customer's needs and wants or they soon go out of business. Our customers were not paying us for our services, but we had just as great an obligation to be responsive to their needs as if they were. Lovelock[4] describes steps that should be followed to provide services that are attuned to the customer. Although these steps are designed with service marketing in mind, slightly modified they provide excellent guidelines for *any* service provision. The following are the steps that directed us:

Step 1: Develop User Trust. We had to develop in our users a trust that we would provide them with high-quality products in a speedy manner. If we did not do so, we would not get repeat business and would miss an opportunity to have some real effect in improving the quality and accessibility of special education software.

Step 2: Understand the Users' Habits. We had to be responsive to the environments of our users and understand their constraints and needs. Constraints, such as the times of day that teachers or administrators could contact the center, whether users would be available for telephone call-backs or whether this would be an intrusion on their working day, whether users preferred home contact to business contact, all had to be recognized and responded to.

Step 3: Pretest New Procedures and Equipment. Before we set up any procedures for contacting the center, and before we decided on the final format for providing information, we had to pretest them with a few of our clients to make sure they were useful and appropriate. Examples of our pretesting ranged from testing the procedures used for

responding to users who contacted us by telephone to testing the interface that was designed to meet those who used our on-line electronic database via a computer and a modem.

Step 4: Understand the Determinants of User Behavior. If the demand for the center's services fluctuated, we needed to know the reason for those fluctuations. If they were due to the center's performance, we could modify that; if the reason was outside our sphere, we needed to understand it and adjust our operations as needed. For example, we determined that the growth in requests in the spring was due primarily to the increased number of requests from parents who were making plans for summer when many would have their children home all day. Another surge in calls would be found in summer; these would be from administrators preparing for the new school year. In the fall a third bulge in the numbers would be the result of teachers seeking information now that they were back in the classroom with their students. Understanding these surges in requests meant that we could prepare ourselves to handle the additional workload and to anticipate the types of requests we might receive.

Step 5: Promote the Benefits of the Services. This was an absolutely critical step. If the users did not know what kinds of free services the center offered, they would go without the benefits of that resource.

Step 6: Monitor and Evaluate Performance. The center was to be involved, not in a static process, but in a dynamic one that would change and build over time. We had to constantly monitor the process of service delivery to find out, for example, was usage increasing? Were the same people coming back a second or a third time? Were we improving productivity and turnaround time? The important thing was to learn from experience (both good and bad) as we went along, and take corrective action where needed.

One final, important consideration entered into our design. We decided that, to avoid any unnecessary confusion on the part of the users, the center must project itself as a single entity from the beginning, even though the contractors providing its services were, in fact, geographically separated. This was particularly important for providing technical assistance and information services. These services came from separate sources—SRI and LINC—and we anticipated that a single user in one telephone call might inquire about *both* technical assistance *and* information on available software. We did not want them to have to make a separate call to each location. The following procedures were

established with these considerations in mind.

- Toll-free (800) lines were installed at SRI and at LINC Resources for voice and TDD (telecommunications device for the deaf) calls; inquirers were encouraged to make free telephone calls to the center as soon as possible to learn about its services and pass the word around to their colleagues. In addition, we set up mailboxes on major electronic networks.

- A single mailing address at SRI was provided for users who preferred to write their requests; and as a return address for all information sent from the center. This provided us with an additional quality check as it ensured that all mail failing to reach its destination, was returned to a single office.

- We designed a set of interactive questions that users would encounter as they reached the center at either SRI or LINC—the principal assistance providers in the center. These questions, and the answers they elicited, were to ensure that each user's needs were fully articulated and that sufficient back ground was obtained for us to provide the correct type of in formation and assistance.

- We developed a standardized system, based on the interactive questions, to log requests as they were received and to initiate a monitoring process.

- We established procedures by which requests were relayed (for programming help, information about software, and so on) to the correct service provider.

- We established quality assurance checks to review progress of requests and ensure rapid turnaround of information.

- Finally, we established a standardized response log so we could keep a detailed track of inquiries and how they had been handled.

The Electronic Network Support

The center was to be a *technology* center, and as such we felt it should be in tune with the rapidly changing technological environment—an environment in which telecommunications plays an increasingly important role. To ensure that the special education population kept pace with other populations, we based the center's functions on a

telecommunications network. This was a microcomputer-based, multi-user, auto-answer, Baudot-compatible messaging system, founded on a system that already existed at SRI—Deafnet. The system was based on a Tandy 6000 generously loaned to us by the Radio Shack Education Division of Tandy Corporation.

Operations

Building Awareness. Soon after the initiation of the center, we established mechanisms to inform potential users of its existence, describe its services, and tell people how to contact the center for more information and help. Our outreach program was necessarily limited by the fact that federal regulations restrict the types of brochures or materials that can be printed and distributed. However, a simple brochure (Exhibit 1) was designed and printed, and periodic mailings went to classrooms, school districts, resource centers, publishers, developers, state departments of education, advocacy groups, organizations associated with special education, and people requesting information on special education materials. This brochure was also distributed by computer manufacturers, software developers and conference coordinators. We sent out a press release to major newspapers and special education and technology journals throughout the country (e.g., *Bounty, Catalyst, Classroom Computer News, The Computing Teacher, Electronic Education, Electronic Learning, Byte Magazine* and *InfoWorld*). We were also able to obtain press coverage in national magazines such as *USA Today* and *Newsweek* at no cost to the center.

Getting Help. Users could get the assistance they needed in a number of ways, depending on the equipment available to them. Most reached the center through the toll-free telephone; many preferred to write for assistance, and for them a single mailing address at SRI was provided. As the center entered its second year, users were able to reach it directly by computer through its electronic messaging network, HelpNet. Using a computer with a modem, a user reached the center's computer through a toll-free (800) number at any time of the day or night. A microcomputer-based, interactive program was written to guide the first-time HelpNet user. The program gathered information about the user's needs and assigned a temporary mailbox through which the user communicated with center staff while the request was being worked on. HelpNet was regularly used as a mail network by software developers, teachers, researchers, and others with an interest in helping improve the quality of special education software. Thus, the network served as a communication medium for sharing ideas and providing information.

A user told us...

"Because of this [HelpNet] board there have been a lot of really special kids on the receiving end of some help that has been developed by a lot of us working together...thanks again."

In Year 3 users were able to dial up the database established at LINC Resources in Columbus, Ohio, and perform their own searches. It is important to recognize that designing access to the database required considerable planning and expertise. When we analyzed other databases to understand strengths and weaknesses of the systems, one problem that had to be solved before we went public with on-line searching surfaced as the most critical: people had to be able to use the system without training. The system therefore had to be so friendly that users could use everyday language in working with it. They should not have to think of special terminology or need to know any computer commands to be able to get the information they wanted; rather, the words that came naturally to them must be the words used in the database to describe the technology. What LINC developed was what they called the "Living Thesaurus." We believe it helped overcome much of the hesitation many people have in using on-line databases and was a large reason why the database use continued to grow so rapidly in the third year.

Providing Technical Assistance

In the original design it was thought that one way of improving the state of special education software would be to help people who developed instructional programs. Through the center we offered programming assistance, at no cost, to authors of programs written in BASIC, Pascal, or LOGO. Their programs had to be substantially complete and error-free for us to be able to help them, and our focus was on programming rather than pedagogical or content concerns. Our programming assistance took the form of subroutines that enhanced a program. (A subroutine is a sequence of computer instructions for pertorming a specified task that can be used repeatedly in a program or in different programs.) Because the center's goal was to provide help to as many people as possible in as short a time as possible, the staff tried to provide generalized subroutines that could be shared with other developers to enhance their work.

The kinds of requests we received for this type of assistance included help writing programs that use voice output as well as text (especially important for the blind student), provide visual cues (for deaf students), access tape players or videodisc players for multimedia presentations, or build dictionaries of words to help overcome spelling or reading problems (for children with dyslexia or other disabilities). Complete descriptions of examples of this work are contained in Section IV.

After the center's first year of operation, we received fewer calls for help in providing programming assistance. We felt that this reflected a healthy trend in instructional software development. It was an indicator that software development was increasingly being undertaken by programmers and instructional designers who did not need the relatively limited assistance that we were funded to provide. Those less familiar with the techniques of programming—teachers, parents, and other individuals—who had been forced to develop their own software because of a lack of professionally-developed programs and who had needed our help, were apparently dropping out of the software development arena. At the same time, we were observing a slow increase in the quality of software for the general education and special education markets, and an increased awareness of special education software needs by developers and publishers.

Information Dissemination

Planning and Operations. Our first task in establishing the software clearinghouse was to obtain the information we needed from software publishers in a standardized form that could be readily entered into, and retrieved from, a computerized database. The quality and usefulness of our information services would depend in large part on having the individual data elements in a format that would capture the essential information users needed. The format we finally selected supplied the necessary data that users required to assess the potential quality of a product for individual students. We used the following procedures to achieve these results.

First, we contacted a representative sample of special education software publishers, parents, and school personnel who used microcomputer software programs with exceptional learners, to help us determine the appropriate data elements to be included in the format. Next, using LINC's existing database and its extensive contacts with professional organizations, trade associations, and advocacy groups, we described these data elements and asked for feedback regarding the most desirable format characteristics (e.g., grade/reading levels, subject matter, domain, handicapping conditions, computer type, peripherals). The third step was to circulate a draft format for review and comments. A final format was then completed.

Developing a Classification System. In addition to developing a format for the records themselves, we also had to develop a classification system for searching and retrieving software synopses from the computer database. As requested by the Department of Education, the

skeleton of the National Information Center for Special Education Materials (NICSEM) database was used as a starting point for classifying the microcomputer products. However, because microcomputer software was not a major factor in the education marketplace at the time the NICSEM database was developed, and because new, technology-related terminology had come into everyday use since that database was built, we had to make extensive modifications to the NICSEM Thesaurus. Aiding us in this task was an advisory board with a balance of skills representing the microcomputer publishing industry, parents of handicapped children, special educators, and specialists in vocabulary control systems for information search and retrieval systems. The makeup of the advisory board in Year 1 of the project is provided in Exhibit 2.

Receiving Publisher Input. With the help of our advisory board, we developed a software synopsis form. We were then ready to gather data from publishers. LINC selected 100 publishers and mailed a model synopsis to an established contact person in each. The publisher was asked to enter information about software products according to the categories on the form and mail it back to LINC. After LINC had entered the information into the database, a proof copy was sent to the publisher for proofreading, and last-minute information (e.g., reference to current magazine reviews of the software) was added.

The gathering of information about their software from publishers continued throughout the project's three years to add to, and update, our database software descriptors. We started with a base of 150 descriptors (founded on LINC's existing database), which grew to more than 500 by the time we were finished.

Responding to Information Requests. The center's special education software information database was now ready to provide information to users. From the user's perspective, services to provide information formed the most vital component of the center. Our aim was to provide fast, efficient, customized information services, rather than to provide standardized sets of information abstracts, clumped together as mini-reference sources. For this reason, LINC established files in the database that allowed for extensive, integrated searching, responsive to the unique demands of each individual caller. Using the multiple access points available in the database, information specialists conducted searches that matched users' curriculum needs with their students' functioning levels and handicapping conditions, and with computer type, input devices and special software features desired.

A user told us...

"Fast and efficient too! Good service—spread the word!"

Users told us...

"More than I expected. Thanks for this type of service. We have needed a project that could identify and recommend software for special education for some time."

"Dear friends—I do mean that, too! I have added your materials to my shelf and have shared them with my teachers. I have enjoyed reading what people have to say [on the network] and the great service you have provided in listing and researching software for us...Thanks for a job well done."

"I am excited about your service and its potential for helping me add a new dimension to our instructional program and administrative system."

From the beginning of the project, requests for information came into the center by phone and mail. Information specialists responded to each user, obtained whatever information they needed to respond fully, retrieved the information from the database, and mailed it to the user. Supplemental materials were included when appropriate. (Samples of resource listings and other supplementary information sent to users is shown in Exhibit 3.) By the end of the first year, the information was routinely being sent out 24 hours after the request was received.

Responding Through the Electronic Network. By the second year of the project, users had another way of contacting the center. The HelpNet bulletin board provided free electronic messaging through another toll-free number. Users who preferred to receive their information electronically could leave a request. Information specialists then queried the database and put the search results in the users' electronic mailboxes. This system had the advantage of being available 24 hours a day. Information specialists had the option of leaving personalized messages for users when further information was needed to provide more responsive answers. We discovered that HelpNet users tended to represent a technologically more sophisticated group than the average caller on the voice line, and that these users generally requested technologically more complex information.

On-line Database Searches. Our design anticipated from the start that by the third year our users should be able to dial directly into the database and conduct their own customized searches. After some experimentation it was decided that the most efficient system for such a service was a bulletin board housed on an IBM AT, using menu-driven bulletin board software that would allow access to the center's own search and retrieval system and the database itself. This system gave users the freedom to conduct their own searches and the option of leaving messages for the staff if needed. Each user who registered to use the on-line service was given a User's Guide containing basic instructions for accessing the database.

Although the on-line service proved to be very popular, it in no way supplanted the basic service. Users of the on-line service tended to be a whole new audience rather than the same callers using a different format. Requests by voice telephone and mail continued, their numbers steadily increasing, throughout the second and third years. The expertise of information specialists, trained to analyze user requests and respond efficiently was in even greater demand as the center's services

expanded. In addition to responding to the types of calls they had always received, the specialists also had to assist on-line users with the system.

The Annual Conference

In the spring of each year, educators, administrators, parents, software developers and publishers, researchers, and policymakers met in Washington, D.C., for the Software Center's 2-day conference. The conference was designed to be a problem-solving event. The problem, generally stated, was the lack of high-quality software available for special education students. The people attending the conference were those in a position to remedy the situation, and we invited people who we thought would be most effective in the role of interactive, influential participants, and kept the conference as interactive as possible. As we learned how best to conduct the interactive conferences, we modified their size, making them smaller than most so that emphasis could be on discussion and roundtable, information-sharing sessions. We had no paid vendor exhibits. Instead, a very large portion of conference space was set aside for a technology laboratory available for everyone to demonstrate and test software, and to duplicate public domain programs if they wished.

Program Advisory Committee. A program advisory committee helped us plan the conference each year. The names of those who served on the committee and offered valuable support to our conferences are listed in Exhibit 4. The first conference was designed around three major themes: the design, use, and evaluation of special education software. The second conference had as its themes the major handicapping areas—learning disabled, vision and hearing impaired, and physically impaired—and focused on software solutions for these impairments. The third conference themes were: the process of designing, implementing, and disseminating software, and within this framework participants discussed state-of-the-art software design and production; effective training and implementation; and effective dissemination and distribution of software.

Inviting Participation. Because the number of conference attendees was to be limited, it might seem necessary to select participants. In fact, they "self-selected" in the following manner. Each year a notice of the upcoming conference was sent to people in the following categories: special educators and administrators, parents, software developers and publishers, researchers, policymakers, and industry representatives (e.g., computer manufacturers). In our cover letter inviting

them to attend, we explained the purpose of the conference, its focus on special education software, and its participative nature. We asked that they respond to our invitation on a form we attached, describing their interest and experience with special education *software*— in short, a justification for their attending the conference. Those accepting our invitation were people who were knowledgeable about the subject and felt they had something useful to contribute.

We thought it would be very helpful for those planning on attending the conference to know, in advance, who else would be there so they could plan their time most effectively. For this reason, when all the request forms were returned, we sorted them into participant categories, put them together as a set, and mailed a copy of each set to every participant 2 weeks before the conference started. (We had notified prospective participants that we would circulate copies of entry forms in this manner when we initially asked them to return the form.)

Conference Evaluation. We evaluated each of the conferences on an ongoing basis throughout the proceedings by asking for written input from participants and through informal interviews by center staff members. In the first year we asked participants to complete evaluation sheets; in later years the written input took the form of comments and ideas from participants.This feedback was picked up and read throughout the conference, and, as appropriate, adjustments were made to our proceedings. Results of the interviews were also fed back continuously and acted on as needed.

Assistance to the Model Secondary School for the Deaf

Soon after the project started, we conducted a needs assessment with the faculty of the Model Secondary School for the Deaf (MSSD). We found their needs could be met by providing them with information on specific software—particularly software available for deaf students. We had signs posted throughout the school—close to TTYs, in the computer laboratory, in the faculty lounge, and so on—to make sure that staff and students knew of the center's free services. In addition, the conference provided an excellent forum for MSSD teachers and students to demonstrate software they had developed and discuss its effectiveness in instruction of deaf and hearing-impaired students with other conference attendees.

IV RESULTS

In this section we discuss the changing environment in which the center operated and then examine the success of the center's components—technical assistance, information dissemination, and annual conferences—in increasing the quantity and quality of microcomputer software applicable to special education and increasing its accessibility.

We also examine the center in terms of how successful we were at institutionalizing some or all of its services, since an important understanding we had regarding the goals of the Software Center as it was originally conceived was that at the end of the 3-year project we should try to ensure some continuation of its services without federal support. This philosophy was integral to our original design and influenced how we went about the center's business. Under these circumstances, one objective might be that the center would end up operating as a self-supporting entity, with users paying a low fee for its services. A second model might be that the various services the center provided would be taken over by the private sector or by others who were willing to provide them at no-cost to the user. In fact, a decision was made by the federal government shortly before the close of the project to initiate another center—providing the services of both the Software Center and its "sister" center, the Center for Special Education Technology, for an additional 4 years.

Changes in the Environment

In Section II we identified 4 sets of users of the center's services: those needing specific software information, those developing software, software distributors, and people making development and purchase decisions. As the center developed over 3 years, we discovered that, if we were to serve this variety of users satisfactorily, the center had to stay flexible in the face of many changes. In this time frame, the status of the technology itself changed, and computers became institutionalized in schools. The market for good educational software firmed, and markets for special education applications software were established. It was becoming increasingly clear that many technology products that had application in the regular education market also had application in segments of the special education market; and the reverse was also

proving to be true: many products initially designed with special education users in mind turned out to have broad application in the education and business markets.

Reflecting this climate of change, the first set of users—those who needed information about available software—grew rapidly. The second set, who required programming assistance, diminished. The needs of the software distributors were also for information, but this was information of another type: they needed to understand the market so they could provide the software and influence its development. This need remained constant throughout the life of the center. The fourth set—the decisionmakers—needed two kinds of information. Developers needed to understand special education needs and constraints; people making purchase decisions needed to know about software that was effective. Their needs grew throughout the project.

Thus, providing information and ensuring that information was shared among the sectors most likely to influence the development and use of high-quality software for special education students became a principal motivator for the center; providing technical assistance in developing specific programming routines dropped to a secondary role.

Technical Assistance Results

In the first year of the center's operations we received 85 requests for help relating to programming and 560 other general assistance calls. These early requests underscored the need, at that time, for providing assistance of some kind to special education software developers and users, even if their requests did not, strictly speaking, always fall within the bounds of the center's mission. Indeed, as center professionals talked with program authors to assess the nature of the problem, the ensuing conversation often resulted in a better definition of the problem and program authors were able to complete their programs themselves.

In response to the requests for programming assistance, a number of subroutines were prepared, delivered to the requesters, and also posted on our HelpNet bulletin board to be downloaded and used by others. In addition, we encouraged users to put subroutines they had developed on the bulletin board to be shared. Below are descriptions of two sample requests that were addressed by subroutines. Printouts of the subroutines themselves are provided in Exhibit 5. The subroutines generated will be delivered to the U.S. Department of Education.

Request 1. In a county school district a number of programs had been written in LOGO and BASIC by teachers and special education specialists for use by moderately and severely handicapped students. Many teachers in the district had asked for a voice component for these programs to aid student learning. We were asked first to provide a subroutine to add voice output to a math program. The district was using compatible computers and peripherals across its special education classrooms, and we were asked that the subroutine generated be usable also by the other district-generated programs.

Request 2. A relatively common problem for the special educator is that of making a program acccessible to the student who has impaired mobility. Such students may have difficulty using a keyboard, or may be able to provide input to the computer only by means of a foot switch, a tongue switch, or a wand held in the mouth or attached to the head. These all come under the heading of "single switch access," where the student, instead of having to strike a number of keys when responding to the computer, must be able to respond with a single "hit." One of our earliest requests was for a subroutine that would provide single switch access. The subroutine prepared for this request had applications in a number of programs and covered a broad spectrum of physical disabilities.

RESULT 1: Success of technical assistance component in improving the quantity and quality of microcomputer software applicable to special education and increasing its accessibility.

This component was designed to improve the *quality* of a certain type of software, mostly that designed by inexperienced developers. In this way it would also improve the *quantity* of software (by making software more usable and useful) and thus improve *accessibility*. It is very difficult to provide hard numbers to show whether we were successful in this component. However, the examples above provide some idea of the ripple effect one instance of technical assistance can have on the special education population. In the first instance, the subroutine developed was quite generic, and it added value to a number of programs being used in the district. A call to the district revealed that approximately 300 handicapped children in a single year had benefited from the software modified with the center's subroutine. As new students move through the classroom, this number will grow.

The subroutine developed for single-switch access has, as we have said, applications in a number of software programs and covers a broad spectrum of physical disabilities. The subroutine was delivered to the original requester and posted on our electronic bulletin board for anyone to download and use. We can only guess at the number of people who made use of it in existing programs or added it to programs they were developing; but since single-switch devices are among the items most demanded from special educators, and we can assume that many students will benefit from this subroutine.

Information Dissemination Results

Our original plan called for the center to respond to 5,000 requests for information per year. The numbers of requests filled far exceeded these expectations, with the numbers of callers and inquirers increasing weekly. By the time the center closed its doors, more than 16,000 people had contacted the center; each contact generated multiple information requests. In year 1 each inquiry generated an average of 2.5 requests; by the end of the second year the number of software descriptors generated for each inquiry was more than 5; and by the close of the project 7 descriptors per request was not unusual. Figure 1 is a graph showing this tendency for multiple requests from September 1986 to April 1987.

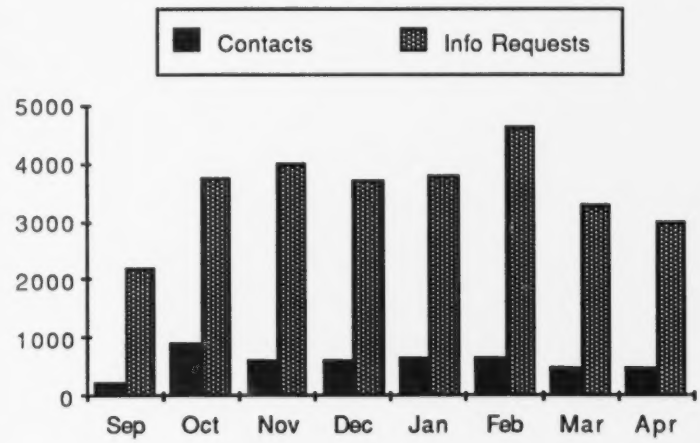


Figure 1. Pattern of Information Requests, September 1986 - April 1987

We requested an extension of our contract with no additional funds so we could continue providing some support to users until the new, federally-funded information center was initiated. By the end of September 1987 more than 75,000 descriptors were generated in response to approximately 16,000 requests. A sample set of descriptors is contained in Exhibit 6.

Figures 2 and 3 provide a profile of center users, and the disabilities their requests represented. Results are provided only for year 2 (1985-86) and year 3 (1986-87) when the center was well established; a number of people knew of its existence, and a reliable pattern to the kinds of requests we received was therefore established.

In both years, as shown in Figure 2, leading users of the center were teachers and administrators. In year 2 these categories combined totaled 58% of all users, and in year 3 they represented 55% of all users. Parents, who in our second year represented only 10% of users, by year 3 represented 17% . A larger percentage of software developers requested information also—their representation grew from 4% in year 2 to 14% in year 3. Health professionals (4%) used the center less in year 3 than in the previous year (8%).

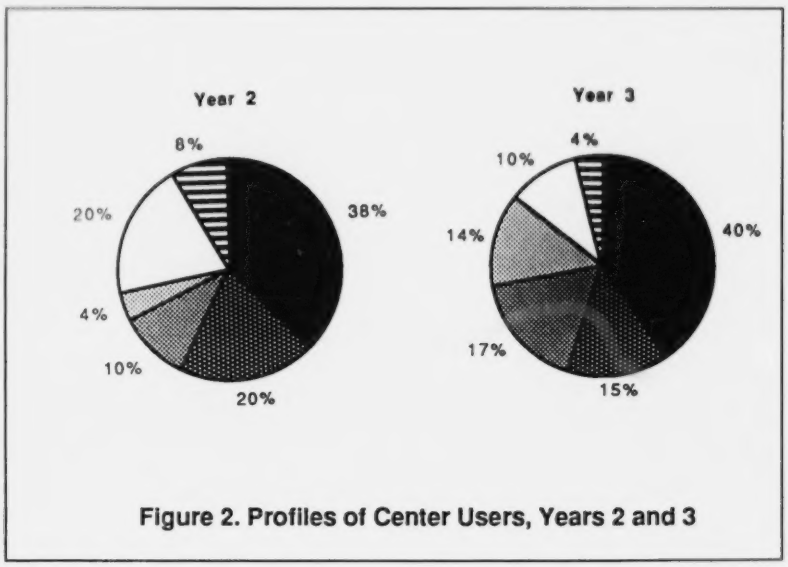


Figure 2. Profiles of Center Users, Years 2 and 3

Figure 3 shows the disabilities represented by user requests; these changed quite markedly from year 2 to year 3. The greatest percentage (32%) of requests in 1985-86 was for software to assist in the instruction of learning-disabled students; in year 3 they represented only 26% of requests. Software for mentally retarded students gained interest, and software to assist in the instruction of physically disabled students went from 9% in year 2 to 15% in year 3. Requests for software for the visually impaired, the hearing impaired, and behaviorally disabled students remained relatively stable for both years.

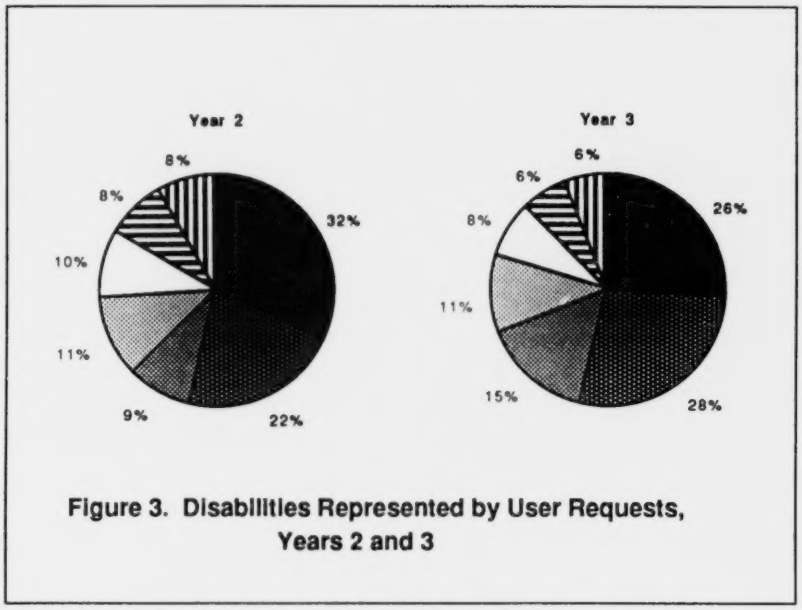


Figure 3. Disabilities Represented by User Requests, Years 2 and 3

Figure 4 shows the types of software requested. Information about software for teaching language arts was the most requested (54% of requests), with mathematics software trailing far behind (16% of requests). The number of requests for information on software for teaching speech, independent living skills, and for career and vocation guidance were considerably lower, as were requests for information on administrative software.

These results show the software needs of the special education popula-

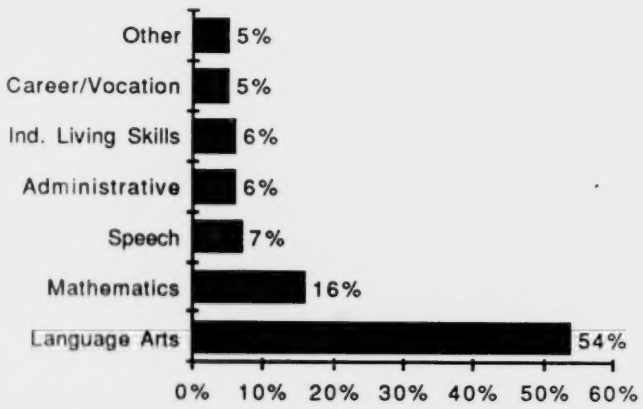


Figure 4. Software Categories Represented by User Information Requests

tion differing from those of the general education population. Becker[5] reports that, in a national sample of 2,100 computer-using elementary, middle, and high schools, computers were used most frequently to teach mathematics. In these schools, in kindergarten through third grade, 42% of computer time was devoted to mathematics; in grades 4 through 8 it was 28%; and in grades 9 through 12.7%. Computers were used to teach language arts only 18% of the time in kindergarten through third grade; 12% in grades 4 through 8; and 4% in grades 9 through 12. The major interest shown by the center's users for quality language arts software may be an indicator of a market niche that has not been sufficiently addressed by software developers.

RESULT 2. Success of information dissemination component in improving the quantity and quality of microcomputer software applicable to special education and increasing its accessibility.

We believe that the information dissemination component improved the *quantity* of special education software distributed because educators, parents, and others who asked for information were specific in their inquiries, and we therefore assume that they eventually purchased at least one package of software. (As we have seen, a single inquiry resulted in information on 7 pieces of software, on the average, so our the estimate of one purchase for each inquiry is somewhat conservative.)

The information component also had a significant effect on the *quality* of software through LINC's interactions with publishers as they established the database. The form that was used to gather information on software helped establish criteria for developing software for special education students for many of these contacts.

Regarding the *accessibility* of special education software, our information dissemination component was specifically designed for this aspect. If each software descriptor we generated influenced the purchase or use of software for just one handicapped student (a very conservative estimate), then at least 75,000 students benefited from the center's services. In fact, the number is probably many times larger than this.

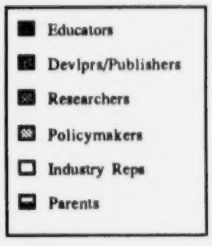
Referrals to the Center

A final important indicator of effectiveness of our information provision is provided by the fact that referrals to the center came from such sources as industry (e.g., special education divisions in Apple Computer, IBM, Tandy Corporation, The Learning Company, Mindscape), state departments of education (e.g., California Department of Education), state resource centers (e.g., Florida Diagnostic and Learning Resource Centers), and school districts. Such persons and agencies are extremely cautious about making referrals and do so only when they are sure of the quality of the service provided and trust that this quality is maintained.

Annual Conference Results

The annual conference was designed to bring together educators, administrators, parents, software developers and publishers, researchers, and policymakers to share ideas, discuss needs, and advance the state of special education software, and to help guide the center in its work. How successful were the conferences in bringing those people together and in performing their tasks? We look at conference attendance to see whether the right mix was obtained for effective conference outcomes.

Attendance. There were 538 registered participants at the first year's conference; they were joined by more than 200 students, aides and volunteers who helped out as demonstrators and coordinators. As shown in Figure 4, of the 538, 70% were educators and administrators, 3% were parents, 8% were software developers and publishers, 7% were researchers, and 9% were policymakers. In that year, industry representatives were not tallied as participants, but representatives of 29 companies attended the conference and exhibited their products.



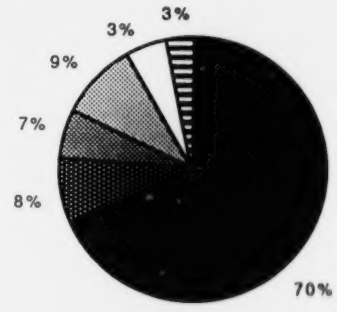


Figure 5. Participant Representation, Year 1 Conference

At the request of the government, we drastically reduced the size of the second year's conference. We also tried to get a more even distribution of the categories of people attending and wanted fuller participation from industry representatives—particularly those representing computer and peripherals companies. Figure 5 illustrates how we achieved all these goals. The second year's conference was attended by 185 people; 28% were educators and administrators, 28% were software developers and publishers, 14% were researchers, and 11% were policymakers. A number of participants also identified themselves as parents of special education students, and industry representatives and service providers accounted for the last 19%. In the third year, 130 people attended the conference. Thirty-nine percent were educators and administrators, 29% were software developers and publishers, 9% were researchers, and 3% were policymakers. Twenty-six industry representatives accounted for the remaining 20% of participants.

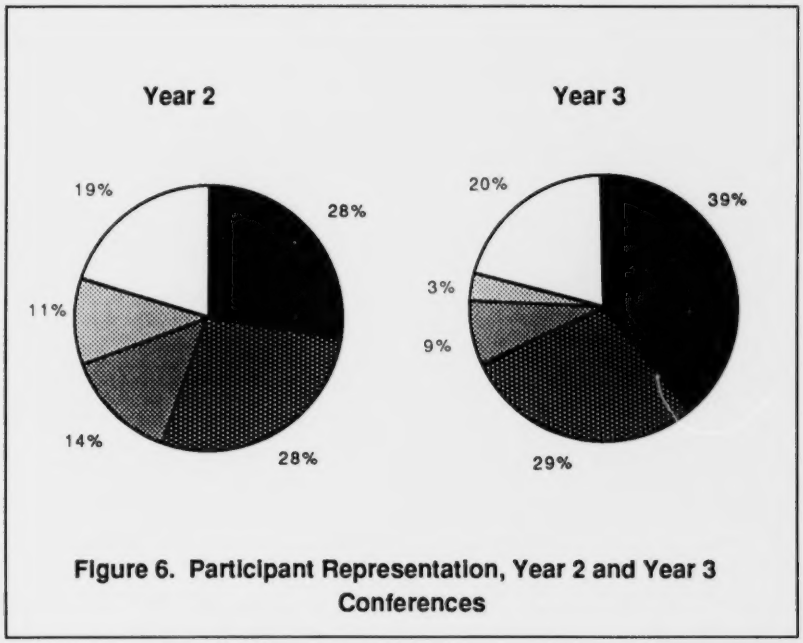


Figure 6. Participant Representation, Year 2 and Year 3 Conferences

RESULT 3. Success of conference component in improving the quantity and quality of microcomputer software applicable to special education and increasing its accessibility.

The conference was designed to provide a forum to *influence* improvement in the quantity and quality of microcomputer software applicable to special education and increase its accessibility. We measure our success in this area by (1) our ability to set the stage so there could be productive dialogue between the stakeholders in the special education software arena—educators, software publishers and developers, researchers, policymakers, and hardware manufacturers—and (2) feedback from participants.

Figures 4 and 5 showed dramatically the successful change in the mix of participants over succeeding years. In year 1, educators outweighed the other four participant categories. Year 2 shows an even balance between educators and publishers and software developers—a very necessary balance for us to be able to promote discussion between these two groups. The number of industry representatives, including people from the major computer companies and special education peripheral companies, had also increased. This change reflected our belief that any discussion on improving the quality of software must include the hardware providers.

Finally, in year 3 the same three categories again made up the main body of participants. This pattern reflects the trend of computer and related hardware industries, and the software industry, to take a leadership role in working with educators to produce the types of software—for special education and regular education—needed in the classroom and for administrative purposes. The policymakers' role was lessened somewhat because they had taken the necessary action to "get the ball rolling" toward private-sector involvement. The researchers' role was also reduced as the industry moved beyond questions of basic design toward questions of application within a curriculum, and dissemination of high-quality software. The conference component, then, was successful in addressing the need to establish a forum to influence the quality, quantity, and accessibility of special education software.

A participant told us ...

"Careful preparation, thoughtful planning and dynamic design insured the total involvement of participants. On behalf of the numerous special education students who will ultimately benefit from the information disseminated I would like to thank you and your dedicated staff."

The feedback we received from participants was also useful in assessing whether the conference was successful in supporting our overall objectives. The first year's participants reported that they felt the conference had provided a forum for them to learn what software was available and what was under development or being researched. They

Other feedback ...

"There was a great lab that was set up to demonstrate software...this was a very productive conference!"

asked for more structure to facilitate their discussions. They reported that they found the exhibit of federally funded projects and the microcomputer lab in which software could be demonstrated and tested to be very useful.

RESULT 4. Extent to which we were able to attain the goal of encouraging continuation of services by non-federally-funded entities.

Institutionalizing The Center

As we have said, the idea that the center should become self-supporting, or have at least some of its components be self-supporting, was integral to our original design and influenced how we went about the center's business. By the end of our third year we can say that we were generally successful in this endeavor. The center's ideas and successes were emulated by others, and we were able to find partners who would support many of the center's services after our project was complete.

For example, through AppleLink, the Special Education Division of Apple Computer has established a database of information about special education software, hardware, and resources that can be accessed by Apple's own dealers and also by many others. Wanderman,[6] describing AppleLink, says "[on AppleLink] there are listings of news items, technical information, a product catalog, and product prices... There are numerous pieces of information about how Apple computers are being used in the field of education, and specifically the field of special education."

A core set of Apple dealers are becoming experts on special education, and teachers and parents of special education students are encouraged to contact these expert Apple dealers to ask about available software. In addition, Apple has established a forum on SpecialNet where special educators, parents, students, and others can get together and share information, ideas, and resources.

Although IBM has long had an interest in special education and rehabilitation problems that can be solved by technology, this company had not focused on information provision until very recently. Starting in October 1987, IBM will establish a special education forum on CompuServe providing special education technology information to the 375,000 users of that service.

We believe it is significant that these two very large computer companies, which play an important role in education today, have chosen to set aside resources for these special education information endeavors.

Regarding the center's own database, we have also always assumed that this important resource, housed at LINC Resources, could become the basis of services provided by LINC itself, if and when federal funds cease. These, then, are three important resources that would start filling the gap if the federal government were not continuing to fund its own special education information center.

Not only large companies are considering starting information services. Dr. Bill Tober, a user in Kentucky, sent the following message to us on HelpNet, just before that network closed down:

> *You folks have been very special and I will continue to use the packet of materials that you sent several months ago... Through our PC Users group we are giving Education a special place and hope to fund an 800 number in the not too distant future.*

Institutionalizing The Conference

The conference component is the second important service provided by the center that could be continued after federal funding ceased. The conference provided by the center was unique in that it concentrated attention on special education *software*. In all the national and regional conferences on technology and the handicapped, none have this singular focus.The National Cristina Foundation, which provides computers, other hardware, and software packages to school district and state programs for use by special education students and rehabilitation centers, recognized the unique resource offered by the annual software conference. Principals of the Foundation, which is based in New York City, have shown considerable interest in supporting continuation of the annual conference. The result of ongoing discussions will be largely influenced by the outcome of the design of the new information center's conferences.

Conclusions

We conclude that the center's successful mode of information delivery can serve as an information provision model, not only to service providers in the special education community, but to anyone disseminating information or providing technical assistance. A number of factors go toward making information delivery a success, and the center's successes underscore them.

Service was clearly focused: the clearinghouse component focused on

providing a specific body of information; the conference focused on the software side of special education technology. The services were easy to describe, explain, and advertise; and the audience was clearly defined. Our services met real needs, with complete and accurate information provided in a usable format, and the information was kept current through continual monitoring and editing.

Center operations were efficient because we developed procedures enabling calls to be handled routinely within 24 hours, while still allowing for individualized treatment of each caller. Access to the service was direct, and it was free to the user (ensuring access to information by all, not just those who could afford it). Finally, and perhaps most important, the staff was skilled in working with people and exhibited those communication skills that are critical for the success of *any* information center.

V LESSONS LEARNED/RECOMMENDATIONS

Because the center became focused around information provision, and because the need for information is very great, particularly in the special education community, we have devoted much of this section to a discussion about the best ways of responding to information needs. In designing and running the center, we learned a great deal about some successful methods for sharing information. The lessons we have learned should not be lost. The center can serve as an information provision model, not only to service providers in the special education community, but to anyone distributing or disseminating needed information and technical assistance.

First we make two recommendations concerning delivery of special education technology information. Following this, because we believe that our model of announcing services and providing free access can work as well for providing information about, say, health services or commercial products as it did for special education technology information, we provide some basic rules for information dissemination, based on the lessons we learned over the course of our 3-year project.

Disseminating Special Education Technology Information

Recommendation 1: Conduct a Systematic Advertising Campaign. The center's mode was to try to let the world know about its services, and to give users who had heard about us a way to access those services free of charge. We chose this way of disseminating information because we wanted to give users help that was tailored to their particular needs (as opposed to predetermining their needs and distributing vast numbers of printed packages). This model for information provision turned out to be very successful. It would probably have been even more successful if we had been able to conduct a multimedia campaign to let more people know the kind of help that was available.

In a federally funded project like this, there are constraints on using federal funds for the production of audiovisual materials. In this case we feel the constraints under which our advertising campaign operated

kept the center from reaching its potential capacity. Thus, our first recommendation is to allow for the implementation of a systematic campaign through journals, radio spots, and public television to advertise the information services being offered. Such a campaign need not entail a large investment. Radio and television networks—especially the public service networks—will frequently provide free air time; newspapers and journals, too, will provide space at no charge for something that has reader appeal.

Recommendation 2: Provide Information on Evaluation/Model Use. The process we used to select software relied on input from practitioners and from publishers and developers, on journal reviews, and on the knowledge of center staff members. In this way we were able to establish that we had descriptors of *high-quality* software in the database. It was not the business of the center to evaluate the software on which it was providing information. However, many of our users asked for information on how the software—particularly instructional software—had been evaluated. They were disappointed when we could not supply this information. An information center might not have the staff capability or the funds to evaluate software itself, but at a minimum we suggest that the record for each software descriptor contain fields for entering whether or not the software has been evaluated—and, if it has, by whom and the evaluation criteria.

It can also be helpful for special education teachers to know how others have used instructional software in situations similar to their own. Many of our users wanted information about "model use" of certain instructional packages, but that, too, was not part of our database structure. Here again we recommend that such information be added to the software descriptor record, if it is available and current.

Basic Rules for Information Dissemination

From the lessons we learned over the course of our project, we derived the following set of "rules" for running an information center. These are commonsense notions, rather than unusual discoveries, but it is often the commonsense rules that get lost in the fast pace of setting up a service venture and keeping it running.

Rule 1: Know the Business You Are In. In setting up an information center, one must be very clear about what information can and cannot be provided. In the business world this translates to "knowing the business you are in." However, it is much easier to define a hard

product (e.g., a typewriter) that describes the business you are in (office supplies), than it is to describe limits on types of information to be provided. The limits may only start becoming clear when a database structure is being established, but by then it will be too late. Limits need to be set before letting people know about the resource, so they can be told exactly what they can ask for.

Rule 2: Make Sure Your Users Know the Business You Are In. After establishing limits on the information that is to be provided, the immediate next step is to be sure your users know what business you are in so they are more likely to be prepared to ask the right questions to get at the information they need. If they are at all unsure about what they can or cannot get, a great deal of valuable time (theirs and yours) will be wasted defining the limits over the phone or through the mail. This rule also relates to our recommendations about conducting a systematic advertising campaign to let people know about the center and its services.

Rule 3: Keep Information Up-to-date and Applicable. The information you are providing must be up-to-date and applicable to the users. From the user's standpoint it is worse to get wrong or outdated information than to get no information.

Rule 4: Be Prepared to Tell Users About Other Resources. In spite of the fact that you have followed Rule 2 and made sure users really know the business you are in, you will still have people asking for information that is outside the scope of your operation. You must be ready to help them. You should be prepared to provide them with other avenues by which they can get the help they need. Have such a resource list available either for mailing or for providing the information by telephone or electronic mail.

Rule 5: Make Use of Technology. As we set up and ran the center we pushed the available technology to its limit, and we concluded the project with a microcomputer-based, multiuser, auto-answer, privacy-assured database retrieval and message system. Users of the on-line database search system required no special training; they found themselves in a friendly environment once they had dialed up, and they typed in everyday language (instead of "computerese") to retrieve data. This successful conclusion resulted from the commitment, initiated in the RFP, to make best use possible of technology that was available at the time.

One has to plan for technology use throughout the life of the project—and in a 3-year project the technologies that will be used in year 3 may not be even be at the development stage in year 1. So planning for technology use means keeping in touch with technological advances, and retaining a certain amout of flexibility so that new technologies can be brought into the dissemination design as the project proceeds. For example, it is not at all inconceivable for an information center to consider disseminating its information to state or regional resource centers in the form of large segments of the database contained on floppy disks, and eventually the entire database to be shared via CD-ROM (compact disc, read-only memory).These regional centers could then disseminate the information themselves, or provide access to their own set of users. The goal is to reduce costs by making an information center less labor-intensive. Doing so means continually upgrading the capability to disseminate information by the use of current technology.

One caveat about this rule. You must be sure that your interaction with the users is through technologies with which they are comfortable. For example, some people are not sufficiently familiar with computers and modems to retrieve information that way, and for them a phone link may always be needed.

NOTES

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2 Blaschke, C., *Survey of Existing Courseware*, Education Turnkey Systems, Inc., Falls Church, VA, 1983.

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Blaschke, C., *Survey of Existing Courseware*, Education Turnkey Systems, Inc., Falls Church, VA, 1983.

Hayes, J., Editor, *Microcomputer and VCR Usage in Schools, 1985-86*, Quality Education Data Inc., Denver, CO.

Murphy, H.J., Editor, *Computer Technology/Special Education/ Rehabilitation*, Proceedings of the Second Annual Conference, California State University, Northridge, CA, October 16-18, 1986.

Tabler, F.M., *Microcomputers in Special Education*, ERIC Clearinghouse on Handicapped and Gifted Children, The Council for Exceptional Children, Reston, VA, 1983.

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Articles

Burrough, B., "Second Chances", *The Wall Street Journal*, November 10, 1986.

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Stephens, R., "A Voice for the Disabled", *New Scientist,* London, England, June 1987

Summers, T.A., "Achieving a Personal Best", *inCider,* December 1986.

Wheeler, D.L., "Artificial-Intelligence Researchers Develop Electronic Tutors to Aid Learning Process", *The Chronicle of Higher Education*, May 20, 1987, p. 6.

EXHIBITS

EXHIBIT 1

Special Education Software Center Brochure

SPECIAL EDUCATION SOFTWARE CENTER

Free services available. Do you need ...

Information about special education software available for various purposes, ages and special needs?

- The Software Center will help you find what you are looking for with free access to the Center's database and information services, 24 hours a day. Contact us by mail, phone, or direct-dial to our HelpNet computer.

To be informed on state-of-the-art issues affecting special education software resources?

- The major issues are addressed by participants at the Special Education Software Center Conference, held each year in Washington, D.C. Attendees include special educators, parents, industry representatives, researchers and other decisionmakers. Contact us to get on the list of those invited to this important, action-oriented forum.

Help in designing and using software for special education instruction and administration?

- The Software Center provides technical assistance on call.

You can reach us by phone, mail or computer. Call, write or log-on today!

Special Education Software Center
SRI International, Room B-S312
333 Ravenswood Avenue
Menlo Park, CA 94025

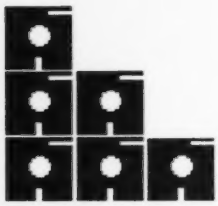
FOR GENERAL INFORMATION & TECHNICAL ASSISTANCE call:
1-800-223-2711
California callers: 1-800-423-1199

TO ACCESS HELPNET COMPUTER
1-800-435-7639
(type "help" at logon)
California callers: 1-800-237-8886

FOR SOFTWARE INFORMATION call:
1-800-327-5892
Ohio callers: 614-263-5462

FOR ONLINE DATABASE SEARCH
1-800-772-7372

Special Education Software Center ... And what it can do for you.



The Center's goals are to make information about computer software that is designed for use with special education students available to you, and to improve the quality of special education software.

Whether you're a parent, teacher, principal, student, teacher's aide, volunteer, concerned neighbor or a school administrator--the Center can help you find the software you're looking for, or help to make the software program you developed suitable for special education use.

ALL SERVICES EASILY ACCESSED BY MAIL, TOLL-FREE PHONE, TTY OR COMPUTER!

special education
software center

SERVING THE NATION ... SERVING YOU

Sponsored by the United States Department of Education's
Special Education Programs, Division of Educational Services

EXHIBIT 2

YEAR 1 SOFTWARE DATABASE ADVISORY BOARD

Kim Allard, Director, SECTOR Project, Utah State University, Logan, UT.

Baxter Burke , National Advisor, Special Education Programs, IBM Corporation , Wilmington, DE.

Alice Fite, Director, American Association of School Librarians, Chicago, IL.

William Gattis, Director, Education Division, Tandy Corporation, Fort Worth, TX.

Bobby Goodson, President, Computer Using Educators, Los Angeles, CA.

Carl Oldsen, National. Center for Research in Vocational Education, Ohio State University, Columbus, OH.

Mel Plager, Division Manager, Consumer Information Services, AT&T, Parsippany, NJ.

Virginia Woods, Special Education Teacher, Austin, TX.

EXHIBIT 3

List of Resources

ORGANIZATIONS

American Council of the Blind
1010 Vermont Avenue, NW
Suite 1100, Washington, DC 20005
(800) 424-8666, (202) 393-3666

American Foundation for the Blind
15 West 16th Street
New York, NY 10011
(212) 620-2000

American Speech-Language Hearing Association
10801 Rockville Pike
Rockville, MD 20852
(301) 897-8682

Association for Children with Learning Disabilities
4156 Library Road
Pittsburgh, PA 15234

Association for Development of Computer-based Instructional Systems
409 Miller Hall
Western Washington University
Bellingham, WA 98225
(206) 676-2860 or 734-6574

Association for Educational Communications & Technology
1126 Sixteenth Street, NW
Washington, DC 20036
(202) 466-4780

Association for Special Education Technology
P.O. Box 152
Allen, TX 75002

Association for Retarded Citizens
2501 Avenue J, P.O. Box 6109
Arlington, TX 76005

Association for Advancement of Rehabilitation Technology
Suite 700, 1101 Connecticut Avenue, NW
Washington, DC 20036
(202) 857-1199

Association of Handicapped Student Service Programs in Postsecondary Education
P.O. Box 21192
Columbus, OH 43221

The Carroll Center for the Blind
770 Centre Street
Newton, MA 02158
(617) 969-6200

Center for Computer Assistance to the Disabled
3001 North Harvard Street
Irving, TX 75062
(817) 640-6613

Closing the Gap
P.O. Box 68
Henderson, MN 56044
(612) 248-3294

Computer Users in Speech and Hearing
Department of Speech Pathology and Audiology
University of South Alabama
Mobile, AL 36688

Computer Users in Speech and Hearing
Center for Communication Disorders
1 Washington Square
San Jose State University
San Jose, CA 95192-0078
(408) 277-2651

Congress of Organizations of the Physically Handicapped (COPH 2)
2030 Irving Park Road
Chicago, IL 60618

The Council for Exceptional Children
1920 Association Drive
Reston, VA 22091
(703) 620-3660

The Council of State Administrators of Vocational Rehabilitation
1055 Thomas Jefferson Street, NW, Suite 401
Washington, DC 20007

EDUTECH
JWK International Corporation
7617 Little River Turnpike
Annandale, VA 22003
(703) 750-0500

Higher Education and the Handicapped Resource Center
1 Dupont Circle, Suite 670
Washington, DC 20036-1193

International Council for Computers in Education
University of Oregon
1787 Agate Street
Eugene, OR 97403-9905
(503) 686-4414

Minnesota Educational Computing Consortium
3490 Lexington Avenue North
St. Paul, MN 55113

National Association of State Directors of Special Education
Suite 315, 2021 K Street, NW
Washington, DC 20006

National Down Syndrome Congress
1800 Dempster Street
Park Ridge, IL 60068-1146
(800) 232-6372

National Clearing House of Rehabilitation Training Materials
Oklahoma State University
115 Old USDA Building
Stillwater, OK 74078
(405) 624-7650

The National Easter Seal Society
2023 West Ogden Avenue
Chicago, IL 60612
(312) 243-8400

National Information Center for Handicapped Children and Youth
P.O. Box 1492
Washington, DC 20013
(703) 522-3332

National Organization on Disability
2100 Pennsylvania Avenue, NW
Washington, DC 20037
(202) 293-5960

National Rehabilitation Information Center
4407 Eighth Street, NE
Washington, DC 20017
(202) 635-5826
(800) 34-NARIC

National Resource Institute on Children with Handicaps
University of Washington
Mailstop WJ-10
Seattle, WA 98195
(206) 543-2213

Occupational Therapy Microcomputer Club
206 North Green Street
Tuckerton, NJ 08087

The Association for Persons with Severe Handicaps
7010 Roosevelt Way, NE
Seattle, WA 98115
(206) 523-8446

Technology and Media for the Exceptional Person
Division of the Council for Exceptional Children
1920 Association Drive
Reston, VA 22091
(703) 620-3660

Telecommunications for the Deaf, Inc.
814 Thayer Avenue
Silver Spring, MD 20910
(301) 589-3006

TRACE Research and Development Center
Waisman Center, University of Wisconsin-Madison
1500 Highland Avenue
Madison, WI 53705-2280
(608) 262-6966

Young Adult Institute
460 West 34th Street
New York, NY 10001-2382
(212) 563-7474

NETWORKS AND DATABASES

Abledata
National Rehabilitation Information Center
4407 Eighth Street, NE
Washington, D.C. 20017
(202) 635-6090

Bibliographic Retrieval Services
1200 Route 7
Latham, NY 12110
(518) 783-1161

ERIC (Educational Research Information Center)
4833 Rugby Avenue, Suite 301
Bethesda, MD 20814
(301) 656-9723

ECER, The Council for Exceptional Children
1920 Association Drive
Reston, VA 20091
(703) 620-3660

Electronic Information Exchange System
New Jersey Institute of Technology
323 High Street
Newark, NJ 07102
(201) 641-5321

HEX (Handicapped Educational Exchange)
11523 Charlton Drive
Silver Spring, MD 20902
(301) 681-7372
Computer access: (301) 593-7033

CompuServe
5000 Arlington Centre Boulevard
Columbus, OH 43220
(800) 848-8990 (outside Ohio)
(614) 457-8650 (within Ohio)

JAN (Job Accommodation Network)
(800) JAN-PCEH

SpecialNet
National Association of State Directors of Special Education
1201 16th Street, NW, Suite 404E
Washington, DC 20036
(202) 822-7933

SOFTWARE EVALUATION PROJECTS

SECTOR Project
Utah State University
Logan, Utah 84322
(801) 753-7973

Florida Development Learning Resource Center
1450 Martin Blvd.
Merritt Island, FL 32952
(305) 631-1912

ConnSENSE
University of Connecticut
Storrs, CT 06268
(203) 486-4031

MICC
University of Kansas Medical Center
39th & Rainbow
Kansas City, KS 66103
(913) 588-5985

SOURCES OF SOFTWARE EVALUATION FORMS

Center for Innovation in Teaching the Handicapped
School of Education, Indiana University
2805 East Tenth Street
Bloomington, IN 47401

Department of Special Education
San Diego State University
San Diego, CA 92182

Division of Education Media & Technology Services Area
North Carolina State Department of Public Instruction
Raleigh, NC 27611

George Peabody College/Vanderbilt University
Department of Special Education
Box 328
Nashville, TN 37203

Minneapolis Public Schools
Department of Special Education
Prescriptive Instruction Center
254 Upton Avenue S
Minneapolis, MN 55405

Santa Barbara County Schools Library
4400 Cathedral Oaks Road
P.O. Box 6307
Santa Barbara, CA 93160-6307

NEWSPAPERS, JOURNALS, MAGAZINES

Broadcaster
National Association of the Deaf
814 Thayer Avenue
Silver Spring, MD 20910

Bulletin of Science & Technology for the Handicapped
American Association for the Advancement of Science
1776 Massachusetts Avenue
Washington, DC 20036

Closing the Gap
P.O. Box 68
Henderson, MN 56004

Communication Outlook
Artificial Language Laboratory
Computer Science Department
Michigan State University
East Lansing, MI

Computer-Disability News
The National Easter Seal Society
2023 West Ogden Avenue
Chicago, IL 60612

COPH Bulletin
Committee on Personal Computers and the Handicapped
2030 Irving Park Road
Chicago, IL 60618
(312) 477-1813

Curriculum Product Review
EDUCAT Publishers, Inc.
125 Elm Street, P.O. Box 4006
New Canaan, CT 06840-4006
(800) 227-2410

Education Daily and *Education Computer News*
CPI, 951 Pershing Drive
Silver Spring, MD 20910
(301) 587-6300

Electronic Learning
Scholastic, Inc.
730 Broadway
New York, NY 10003-9538

Exceptional Children
The Council for Exceptional Children
1920 Association Drive
Reston, Virginia 22091-1589

IBM Personal Computer Seminar Proceedings
IBM Corporation
P.O. Box 1328
Boca Raton, FL 33432

Journal of Special Education Technology
Utah State University
Logan, UT 84322

Rehabilitation Literature
National Easter Seal Society
2023 West Oglen Avenue
Chicago, IL 60612

Sensory Aids Technology Update
Sensory Aids Foundation,
339 Sherman Avenue, Suite 12
Palo Alto, CA 94306

Special Needs Computing
Technical Communications, Inc.
19 Crescent Court
Sterling, VA 22170

T.H.E. Journal
P.O. Box 17239
Irvine, CA 92713
(714) 261-0366

The Catalyst
Western Center for Microcomputers and the Handicapped
1259 El Camino Real, Suite 275
Menlo Park, CA 94025
(415) 326-6997

The Exceptional Parent
Psy-Ed Corporation
605 Commonwealth Avenue
Boston, MA 02215

The National Logo Exchange
Box 5341
Charlottesville, VA 22905

The Sloane Report
P.O. Box 561689
Miami, FL 33256
(305) 251-2199

UPDATE
LiNC Resources, Inc.
3857 North High Street
Columbus, Ohio 42314

VENDORS OF ADAPTIVE DEVICES

Adaptive Peripherals
4529 Bagley Avenue, North
Seattle, WA 98103
(206) 633-2610

Arts Computer Products, Inc.
145 Tremont Street, Suite 407
Boston, MA 02111
(617) 482-8248

Audio Bionics
9817 Valley View Road
Eden Prairie, MN 55344
(612) 941-5464

Chalk Board, Inc.
3772 Pleasantdale Road
Atlanta, GA 30340
(800) 241-3989 (outside Georgia)
(404) 496-0101 (within Georgia)

Computer Conversations
2350 North Fourth Street
Columbus, Ohio 43202
(614) 263-4324

DADA (Designing Aids for Disabled Adults)
1024 DuPont Street, Suite 5
Toronto, Ontario M6H 2A2, Canada
(416) 533-4494

Don Johnston Developmental Equipment
900 Winnetka Terrace
Lake Zurich, IL 60047
(312) 438-3476

Interstate Voice Products
1849 West Sequoia Avenue
Orange, CA 92668
(714) 937-9010

Koala Technologies Corp.
2065 Junction Avenue
San Jose, CA 95131
(408) 946-4483

Mark Enterprises
P.O. Box 1532
Westford, MA 01886
(617) 692-8570

Microwriter Use, Ltd.
251 East 61st Street
New York, NY 10021
(800) 227-2278, ext. 343

National Research Council of Canada
Medical Engineering Section
Ottawa, Ontario K1A 0R6, Canada

Phone-TTY, Inc.
202 Lexington Avenue
Hackensack, NY 07601
(201) 489-7889

Polytel Computer Products Corp.
1250 Oakmead Parkway, Suite 310
Sunnyvale, CA 94086
(408) 730-1347

Prentke Romich Company
1022 Heyl Road
Wooster, OH 44691
(216) 262-1984

Reactive Systems, Inc.
40 North Van Brunt Street
Englewood, NJ 07631
(201) 568-0446

Rosesoft, Inc.
4710 University Way NE, Suite 602
Seattle, WA 98105
(205) 524-2350

Street Electronics
Special Needs Division
1140 Mark Avenue
Carpinteria, CA 93013
(805) 684-4593

Supersoft
Box 1628
Champaign, IL 61820
(217) 359-2112

Telesensory Systems, Inc.
455 North Bernardo Avenue
Mountain View, CA 94043
(415) 960-0920

The Voice Connection
16835 Skypark Circle, Suite C
Irvine, CA 92714
(714) 261-2366

VTEK
1610 26th Street
Santa Monica, CA 90404
(800) 245-2256 (outside CA)
(800) 521-5605 (inside CA)

Votrax, Inc.
1358 Rankin
Troy, MI 48083
(800) 521-1350

Words +, Inc.
1125 Stewart Court, Suite D
Sunnyvale, CA 94086
(408) 730-9588

ZYGO Industries, Inc.
P.O. Box 1008
Portland, OR 97207-1008
(503) 297-1724

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SOFTWARE CENTER CONFERENCE
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Charles Blaschke, President, Education Turnkey, Inc., Falls Church, MD.

Paul V. Braden, Office of Producitivity, Technology & Innovation, US Department of Commerce, Washington, DC.

Edward J. Cain, Assistant Superintendent, Commack Public Schools, Commack, NY.

Susan Elting, Council for Exceptional Children, Reston, VA.

Nancy B. Fones, Assistant Principal, Model Secondary School for the Deaf, Gallaudet College, Washington, DC.

William J. Gavin, Director of Research, Institute of Logopedics, Wichita, KS.

David Lunney, Professor, East Carolina University, Greenville, NC.

Peter Maggs, Visek and Maggs, Urbana, IL.

Gwendolyn B. Moore, Vice President, COSMOS Corporation, Washington, DC.

Sheldon D. Rosenberg, Board of Education, New York City, NY.

Gilbert Schiffman, Professor of Education, The Johns Hopkins University, Baltimore, MD.

Ron Thorkildsen, Professor, Utah State University, Logan, UT.

Gregg C. Vanderheiden, Director, TRACE R&D Center, University of Wisconsin, Madison, WI.

Robert Zuckerman, Associate Professor, Department of Special Education, Kent State University, Kent, OH.

---

* Not all those listed served all three years. Affiliations and titles are those of the committee member at the time he or she sat on the Program Advisory Committee.

EXHIBIT 5

Sample Subroutines

CATCH THE FISH

This program has been modified
by the Special Education Software Center
to demonstrate the use of speech-on
and speech-off subroutines.

Program is in Apple Basic.

```
]PR#0
]LIST

 1  REM  THIS ROUTINE HAS BEEN       MODIFIED BY THE
 2  REM  SPECIAL EDUCATION           SOFTWARE CENTER
 3  REM  TO DEMONSTRATE USE OF
 4  REM  SPEECH-ON AND SPEECH-OFF
 5  REM  SUBROUTINES
 6  REM
 7  REM
 8  REM
 10  REM ************************
 11  REM
 12  REM  INITIALIZE VOICE
 13 V$ = "": GOSUB 20000
 14  REM
 15  REM ************************
 100  HOME
 110 A = 0
 120  PRINT  TAB( 13);"CATCH THE FISH!!!"
 130  PRINT : PRINT : PRINT "IN THIS GAME YOU ARE THE CAPTAIN OF"
 140  PRINT "A BOAT.  YOU MUST TRY TO:"
 145  PRINT
 150  PRINT  TAB( 12);"CATCH THE FISH!!"
 155  PRINT : PRINT "HOW BIG AN OCEAN DO YOU WANT?"
 160  INPUT "10,20,50,100, OR 1000?";S
 161 F =  INT ( RND (1) * S)
 162  IF S = 10 OR S = 20 OR S = 50 OR S = 100 OR S = 1000 THEN  GOTO 190

 180  PRINT : PRINT "PLEASE CHOOSE EITHER:": GOTO 160
 190  IF F = 0 THEN  GOTO 161
 200  PRINT : PRINT "HERE ARE THE POSITIONS"
 205  GOSUB 20100: REM *** VOICE OFF ***
 210 A = 0
 220  FOR I = 1 TO 10
 230  IF I > 1 THEN  GOTO 250
 240  PRINT S / 10;: NEXT I
 250  PRINT  TAB( 4 * (I - 1));(S / 10) * I;
 260  NEXT I
 300  GOSUB 2000
 310  GOSUB 20200: REM *** VOICE ON ***
 320  PRINT
 400 B =  INT ( RND (1) * S)
 410  PRINT "THERE IS A GIANT FISH HIDING IN THE SEA."
 418  REM ************************
 419  REM  NEXT LINE MODIFIED TO   ACCOMIDATE VOICE OUTPUT
 420  PRINT "WHAT POSITION DO YOU WANT (1 TO ";S;")":
 430  INPUT G
 435  IF G = 0 THEN  GOTO 450
 440  IF G <  = S THEN 460
 450  PRINT "CHOOSE A NUMBER FROM 1 TO ";S: GOTO 420
 460  HOME
```

```
500 Q =  INT (G / (.1 * S))
502  IF Q = 0 THEN Q = 1
505  PRINT "HERE IS YOUR POSITION:"
509  GOSUB 20100: REM *** VOICE OFF ***
510  PRINT  TAB( 4 * Q);"(B)"
520  GOSUB 2000
525  FOR I = 1 TO 500: NEXT I
526  GOSUB 20200: REM *** VOICE ON ***
527  INPUT "HIT 'RETURN' TO FISH: ";X$
530  HOME
540  PRINT "DROP YOUR HOOK": GOSUB 20100: REM *** VOICE OFF ***
541  PRINT  TAB( (4 * Q) - 1);"(B)"
545  GOSUB 3000
547  GOSUB 20200: REM  *** VOICE ON ***
550  FOR I = 1 TO 100: NEXT I
560  FOR I = 1 TO 3
570  PRINT  TAB( 4 * Q);"!"
580  NEXT I
590  GOSUB 3000
600  IF A = 1 THEN 1500
610 D = G - F
620  IF D = 0 THEN  GOTO 1400
700  PRINT "YOU MISSED!"
710  PRINT "YOU ARE AT ";G
720  PRINT "THE FISH IS ": ABS (G - F);" AWAY!"
730  GOTO 420
1400  GOSUB 4000
1410  VTAB (6)
1415  GOSUB 20100: REM *** VOICE OFF ***
1420  PRINT  TAB( 4 * Q);"(FISH)"
1425  GOSUB 20200: REM *** VOICE ON ***
1430  VTAB (15): PRINT
1440  PRINT "***YOU GOT IT!***"
1445  PRINT : PRINT
1450  PRINT "PLAY AGAIN?"
1452  PRINT "TYPE '1' FOR YES"
1454  PRINT "TYPE '2' FOR NO"
1460  INPUT "AND '3' IF YOU WANT TO CHANGE THE SIZE OF YOUR OCEAN.";Z
1470  IF Z = 3 THEN  HOME : GOTO 155
1480  IF Z = 2 THEN 10000
1490  IF Z = 1 THEN  HOME : GOTO 161
1491  PRINT "PLEASE CHOOSE 1,2, OR 3.": GOTO 1450
2000  PRINT : FOR I = 1 TO 40
2010  PRINT "-";
2020  NEXT I: PRINT
2021  PRINT : PRINT : PRINT : FOR I = 1 TO 40
2022  PRINT "-";
2023  NEXT I: PRINT
2030  RETURN
3000  FOR I = 1 TO 40
3010  PRINT "-";: NEXT I: PRINT : RETURN
4000  FOR I = 1 TO 500: NEXT I: RETURN
```

```
10000  PRINT : PRINT : PRINT "SEE YOU LATER"
10010  REM ************************
10011  REM
10012  REM  TURN VOICE OFF
10013  GOSUB 20100
10014  REM
10015  REM ************************
10100  END
19990  REM
19991  REM
19992  REM  SPECIAL EDUCATION
19993  REM   SOFTWARE CENTER
19994  REM
19995  REM    SUBROUTINES:
19996  REM
19997  REM
19998  REM
19999  REM
20000  REM ************************
20001  REM
20002  REM  INITIALIZE ECHO II
20003  REM
20004  REM ************************
20005  REM
20010 VD$ =  CHR$ (4):VE$ =  CHR$ (5)
20020  PRINT VD$"BRUN TEXTALKER.RAM"
20030  PRINT VE$"O": REM  VOICE OFF
20040  TEXT : HOME : REM  CLEAR SCREEN
20050  PRINT VE$"B": REM  VOICE ON
20060  PRINT V$: REM  SAY TITLE
20070  RETURN
20080  FOR V0 = 1 TO 100: NEXT V0
20090  RETURN
20099  REM  CONTROL L
20100  REM ************************
20101  REM
20102  REM  TURN VOICE OFF
20103  REM
20104  REM ************************
20105  REM
20110  PRINT VE$"O"
20120  RETURN
20199  REM  CONTROL L
20200  REM ************************
20201  REM
20202  REM  TURN VOICE ON
20203  REM
20204  REM ************************
20205  REM
20210  PRINT VE$"B"
20220  RETURN
20997  REM
20998  REM
20999  REM  CONTROL L
```

THE BIG ADDING MACHINE

This program has been modified
by the Special Education Software Center
to demonstrate the use of speech-on
and speech-off subroutines.

Program is in Apple Basic.

```
]PR#0
]LIST

 1  REM  THE BIG ADDING MACHINE BY GARY E LEONARD  CALL -A.P.P.L.E. OCT.1
    983
 2  REM ***************************
 3  REM  THIS PROGRAM MODIFIED BY   THE SPECIAL EDUCATION       SOFTWARE
    CENTER
 4  REM  TO DEMONSTRATE USE OF THE  SPEECH-ON AND SPEECH-OFF    SUBROUTIN
    ES
 5  REM
 6  REM ***************************
 7 V$ = "": GOSUB 10000: REM  INIT VOICE
 8  GOSUB 10100: REM  *** VOICE OFF ***
 9  REM ***************************
 10  GOTO 300
 20  VLIN Y,Y + 8 AT X + 2: COLOR= AA: VLIN Y,Y + 8 AT X + 1: RETURN
 30  VLIN Y,Y + 1 AT X: VLIN Y,Y + 4 AT X + 3: VLIN Y + 4,Y + 8 AT X: HLIN
    X,X + 3 AT Y: HLIN X,X + 3 AT Y + 4: HLIN X,X + 3 AT Y + 8: COLOR= A
    A: VLIN Y,Y + 1 AT X - 1: VLIN Y + 1,Y + 3 AT X + 2: VLIN Y + 4,Y +
    8 AT X - 1: RETURN
 40  VLIN Y,Y + 8 AT X + 3: HLIN X,X + 3 AT Y: HLIN X,X + 3 AT Y + 4: HLIN
    X,X + 3 AT Y + 8: COLOR= AA: VLIN Y + 1,Y + 3 AT X + 2: VLIN Y + 5,Y
     + 7 AT X + 2: PLOT X - 1,Y: PLOT X - 1,Y + 4: PLOT X - 1,Y + 8: RETURN

 50  VLIN Y,Y + 4 AT X: VLIN Y,Y + 8 AT X + 3: HLIN X,X + 3 AT Y + 4: COLOR=
    AA: VLIN Y,Y + 4 AT X - 1: VLIN Y,Y + 3 AT X + 2: VLIN Y + 5,Y + 8 AT
    X + 2: RETURN
 60  VLIN Y,Y + 4 AT X: VLIN Y + 4,Y + 8 AT X + 3: HLIN X,X + 3 AT Y: HLIN
    X,X + 3 AT Y + 4: HLIN X,X + 3 AT Y + 8: COLOR= AA: VLIN Y,Y + 4 AT
    X - 1: VLIN Y + 5,Y + 7 AT X + 2: PLOT X - 1,Y + 8: RETURN
 70  VLIN Y,Y + 8 AT X: VLIN Y + 5,Y + 8 AT X + 3: HLIN X,X + 3 AT Y + 5:
     HLIN X,X + 3 AT Y + 8: COLOR= AA: VLIN Y,Y + 8 AT X - 1: VLIN Y + 6
    ,Y + 7 AT X + 2: RETURN
 80  VLIN Y,Y + 8 AT X + 3: HLIN X,X + 3 AT Y: COLOR= AA: VLIN Y + 1,Y +
    8 AT X + 2: PLOT X - 1,Y: RETURN
 90  VLIN Y,Y + 8 AT X: VLIN Y,Y + 8 AT X + 3: HLIN X,X + 3 AT Y: HLIN X,
    X + 3 AT Y + 4: HLIN X,X + 3 AT Y + 8: COLOR= AA: VLIN Y,Y + 8 AT X -
    1: VLIN Y + 1,Y + 3 AT X + 2: VLIN Y + 5,Y + 7 AT X + 2: RETURN
 100  VLIN Y,Y + 3 AT X: VLIN Y,Y + 8 AT X + 3: HLIN X,X + 3 AT Y: HLIN X
    ,X + 3 AT Y + 3: COLOR= AA: VLIN Y,Y + 3 AT X - 1: VLIN Y + 1,Y + 2 AT
    X + 2: VLIN Y + 4,Y + 8 AT X + 2: RETURN
 110  VLIN Y,Y + 8 AT X: VLIN Y,Y + 8 AT X + 3: HLIN X,X + 3 AT Y: HLIN X
    ,X + 3 AT Y + 8: COLOR= AA: VLIN Y,Y + 8 AT X - 1: VLIN Y + 1,Y + 7 AT
    X + 2: RETURN
 120  VLIN Y,Y + 1 AT X: VLIN Y + 4,Y + 6 AT X: VLIN Y,Y + 4 AT X + 3: PLOT
    X,Y + 8: HLIN X,X + 3 AT Y: HLIN X,X + 3 AT Y + 4: COLOR= AA: VLIN Y
    ,Y + 1 AT X - 1: VLIN Y + 4,Y + 6 AT X - 1: VLIN Y + 1,Y + 3 AT X +
    2: PLOT X - 1,Y + 8: RETURN
 130  FOR Y = 18 TO 24: COLOR= A: HLIN X + 1,X + 7 AT Y: COLOR= B: HLIN X
     + 1,X + 7 AT Y + 12: NEXT : CALL 774:C = B:B = A:A = C
 140  COLOR= B: FOR Y = 18 TO 24: HLIN X + 1,X + 7 AT Y + 12: NEXT : CALL
    774: RETURN
```

```
150 X = 1:Y = 1: GOSUB 540:X = 15: GOSUB 540:X = 29: GOSUB 540: RETURN
160  COLOR= 12: FOR D = 1 TO 2:UP = UP + 1: HLIN 14,22 AT 37 - UP: NEXT
    : RETURN
170 S =  - 16336: FOR D = 1 TO 10:SN =  PEEK (S) -  PEEK (S) +  PEEK (S)
     -  PEEK (S): NEXT : RETURN
180  COLOR= 6: FOR Z = 17 TO 36: FOR D = 1 TO 13: CALL 774: NEXT : HLIN
    14,22 AT Z: NEXT :UP = 0: RETURN
190 L =  INT ( RND (1) * 10):M =  INT ( RND (1) * 10): IF L + M ) 9 THEN
    190
200  COLOR= 1:AA = 0:X = 4:Y = 3: ON L GOSUB 20,30,40,50,60,70,80,90,100
    : IF L = 0 THEN  GOSUB 110
210  COLOR= 2:AA = 0:X = 18: ON M GOSUB 20,30,40,50,60,70,80,90,100: IF
    M = 0 THEN  GOSUB 110
214  REM *************************
215  GOSUB 10200: REM  *** VOICE ON ***
216  REM *************************
220  COLOR= 12:X = 32: GOSUB 120: POKE  - 16384,0: POKE  - 16368,0: VTAB
    21: HTAB 15: PRINT "HOW MANY ?";: GET N$: IF  ASC (N$) < 48 OR  ASC
    (N$) ) 57 THEN  GOSUB 170: GOTO 220
224  REM *************************
225  GOSUB 10100: REM  *** VOICE OFF ***
226  REM *************************
230 N =  VAL (N$): COLOR= 6:X = 29:Y = 1: GOSUB 20,30,40,50,60,70,80,90,
    100: IF N = 0 THEN  GOSUB 110
240  IF N = L + M THEN 260
250 A = 1:B = 2:X = 29: FOR D = 1 TO 8: GOSUB 130: NEXT : GOSUB 180: GOSUB
    150: GOTO 200
260 A = 12:B = 2:X = 1: FOR D = 1 TO 8: GOSUB 130: NEXT : GOSUB 160: IF
    UP = 20 THEN 280
270  GOSUB 150: GOTO 190
280  FOR D = 1 TO 16: CALL 774: CALL 774: HOME : VTAB 23: PRINT  TAB( D)
    "YOU WIN";: CALL 774: FOR DD = 1 TO 300: NEXT : NEXT
284  REM *************************
285  GOSUB 10200: REM  *** VOICE ON ***
286  REM *************************
290  HOME : VTAB 23: HTAB 16: FLASH : PRINT "YOU WIN";: FOR D = 1 TO 20:
     PRINT  CHR$ (7);: NEXT : NORMAL : HOME : GOTO 560
300  FOR S = 768 TO 808: READ P: POKE S,P: NEXT
310  DATA  0,0,12,0,0,0,160,0,238,0,3,238,1,3,174,2,3,173,48,192,136,208
    ,10,206,0,3,208,5,206,1,3,240,5,202,240,234,208,238,96,0,0
320  TEXT : HOME : NORMAL :AA$ = "THE BIG ADDING MACHINE":BB$ = "BY GARY
     E. LEONARD"
330  VTAB 7: HTAB 9: FOR D = 1 TO  LEN (AA$): PRINT  MID$ (AA$,D,1);: CALL
    774: FOR DD = 1 TO 50: NEXT : NEXT
340  VTAB 12: HTAB 11: FOR D = 1 TO  LEN (BB$): PRINT  MID$ (BB$,D,1);: CALL
    774: FOR DD = 1 TO 100: NEXT : NEXT
350  FOR D = 1 TO 1000: NEXT
360  HOME :DD$ = "INSTRUCTIONS:":EE$ = "TRY TO FILL THE MACHINE'S TANK B
    Y":FF$ = "GETTING ALL THE CORRECT ANSWERS. WATCH":GG$ = "OUT !!!! ON
    E WRONG ANSWER AND THE TANK":HH$ = "GOES DRY."
370  VTAB 4: HTAB 15: FOR D = 1 TO  LEN (DD$): PRINT  MID$ (DD$,D,1);: CALL
    774: NEXT
```

```
380  VTAB 9: HTAB 5: FOR D = 1 TO  LEN (EE$): PRINT  MID$ (EE$,D,1);: CALL
    774: NEXT
390  PRINT : PRINT : PRINT
400  FOR D = 1 TO  LEN (FF$): PRINT  MID$ (FF$,D,1);: CALL 774: NEXT
410  PRINT : PRINT : PRINT
420  FOR D = 1 TO  LEN (GG$): PRINT  MID$ (GG$,D,1);: CALL 774: NEXT
430  PRINT : PRINT : PRINT
440  FOR D = 1 TO  LEN (HH$): PRINT  MID$ (HH$,D,1);: CALL 774: NEXT
450  PRINT
454  REM ************************
455  GOSUB 10200: REM  *** VOICE ON ***
456  REM ************************
460  VTAB 23: PRINT " PRESS SPACE BAR TO BEGIN . . . . .";: GET ST$: IF
    (ST$) <  > " " THEN 460
470  GR : HOME : COLOR= 2: FOR X = 0 TO 39: VLIN 0,39 AT X: NEXT : COLOR=
    0:X = 1:Y = 1: GOSUB 530:X = 15: COLOR= 0: GOSUB 530:X = 29: COLOR=
    0: GOSUB 530
480 X = 1:Y = 17: GOSUB 550:Y = 29: GOSUB 550:X = 29: GOSUB 550:Y = 17: GOSUB
    550
490  HLIN 13,25 AT 16: HLIN 13,25 AT 37: VLIN 16,37 AT 13: VLIN 16,37 AT
    25: COLOR= 6: FOR Y = 17 TO 36: HLIN 14,24 AT Y: NEXT
500  COLOR= 0: FOR Y = 17 TO 35 STEP 2: HLIN 23,24 AT Y: NEXT
510  HLIN 11,13 AT 7: VLIN 5,9 AT 12: HLIN 25,27 AT 6: HLIN 25,27 AT 8
520  GOTO 190
530  HLIN X,X + 8 AT Y: HLIN X,X + 8 AT Y = 12: VLIN Y,Y + 12 AT X: VLIN
    Y,Y + 12 AT X + 8: COLOR= 6: FOR Z = X + 1 TO X + 7: VLIN Y + 1,Y +
    11 AT Z: NEXT : COLOR= 0: RETURN
540  COLOR= 6: FOR Z = X + 1 TO X + 7: VLIN Y + 1,Y + 11 AT Z: NEXT : RETURN

550  HLIN X,X + 8 AT Y: HLIN X,X + 8 AT Y + 8: VLIN Y,Y + 8 AT X: VLIN Y
    ,Y + 8 AT X + 8: RETURN
555  REM ************************
560  VTAB 23: PRINT " ANOTHER GAME ?";: GET NU$: IF  ASC (NU$) <  > 89 THEN
     GR : TEXT : HOME : GOSUB 10100: END
565  REM  TURN OFF VOICE
566  REM ************************
570  GOSUB 180: GOSUB 150: HOME : GOTO 190
9997  REM
9998  REM
9999  REM  CONTROL L
10000  REM ************************
10002  REM  INITIALIZE ECHO II
10005  REM
10010 VD$ =  CHR$ (4):VE$ =  CHR$ (5)
10020  PRINT VD$"BRUN TEXTALKER.RAM"
10030  PRINT VE$"0": REM  VOICE OFF
10040  TEXT : HOME : REM  CLEAR SCREEN
10050  PRINT VE$"B": REM  VOICE ON
10060  PRINT V$: REM  SAY TITLE
10070  RETURN
10080  FOR V0 = 1 TO 100: NEXT V0
10090  RETURN
10099  REM  CONTROL L
```

```
10100  REM
10102  REM  TURN OFF VOICE
10110  PRINT VE$"O"
10120  RETURN
10199  REM  CONTROL L
10200  REM
10202  REM   TURN VOICE ON
10210  PRINT VE$"B"
10220  RETURN
10997  REM
10998  REM
10999  REM  CONTROL L

]
```

LET'S COUNT

This program has been modified
by the Special Education Software Center
to demonstrate the use of speech-on
and speech-off, big number, and
single switch scanning subroutines.

Program is in Apple Basic.

```
]LIST

 1  REM ************************
 2  REM
 3  REM  THIS PROGRAM HAS BEEN
 4  REM  MODIFIED TO DEMONSTRATE
 5  REM  USE OF SPECIAL EDUCATION
 6  REM  SOFTWARE CNTR SUBROUTINES
 7  REM   W.ROSS, 10/25/85
 8  REM ************************
 9  REM   ORIGINAL AUTHOR:
 10  REM  JULY 19,1983  KATHERYN TYLER
 20  HOME
 30  VTAB 8: HTAB 15: PRINT "LET'S COUNT"
 40  VTAB 13: HTAB 16: PRINT "PROGRAM BY"
 50  VTAB 15: HTAB 14: PRINT "KATHERYN TYLER"
 60  VTAB 16: HTAB 15: PRINT "106 LURAY DR."
 70  VTAB 17: HTAB 15: PRINT "RICHMOND, VA."
 80  VTAB 19: HTAB 15: PRINT "JULY 19,1983"
 90  GOSUB 350
 95  PRINT : INPUT "NUMBER OF TURNS? ";NZ
 100  PRINT : INPUT "MAX. COUNT? <3-10> ";MX: IF MX < 3 OR MX > 10 THEN 1
     00
 102  REM ************************
 103  REM
 104  GOSUB 11000: REM  INIT SCAN
 105 V$ = "LET'S COUNT"
 106  GOSUB 10000: REM  INIT VOICE
 107  REM
 108  REM ************************
 110  GR
 120  FOR Z = 1 TO NZ
 130 H = 0:X = 0
 140 R =  INT ( RND (1) * MX) + 1
 150 C =  INT ( RND (1) * 10) + 1: COLOR= C
 160  FOR T = 1 TO R
 170  HOME
 180  VLIN 5,15 AT H
 190 H = H + 4: FOR S = 1 TO 500: NEXT S
 200  NEXT T
 210  HOME
 218  REM ************************
 219  REM
 220  REM   INPUT "HOW MANY? ";A
 225 VM = MX: PRINT "HOW MANY? "
 226  GOSUB 11100: REM  SINGLE KEY INPUT
 227 A = VN
 228  REM
 229  REM ************************
 230  IF A = R THEN  GOSUB 300
 240  IF A <  > R THEN  GOSUB 370: IF X < 2 GOTO 210
 250  GOSUB 900
```

```
260  NEXT Z
270  TEXT : HOME
280  PRINT "BYE FOR NOW."
283  REM **********************
284  REM
285  GOSUB 10100: REM  TURN OFF VOICE
286  REM
287  REM **********************
290  END
294  PRINT
300  PRINT "IS THE NUMBER. "
305  PRINT : PRINT "TERRIFIC COUNTING!"
310  GOTO 610
350  FOR K = 1 TO 2200: NEXT K: RETURN
370 X = X + 1
380  IF X = 2 THEN  PRINT "THERE ARE "R". COUNT THEM.": GOTO 400
390  PRINT "TRY AGAIN.": FOR K = 1 TO 1500: NEXT K: RETURN
400  FOR K = 1 TO 3500: NEXT K: RETURN
600  GR
610  COLOR= 13
620  PLOT 17,27
630  HLIN 16,18 AT 28
640  HLIN 15,19 AT 29
650  HLIN 14,20 AT 30
660  HLIN 13,21 AT 31
670  HLIN 13,21 AT 32
680  HLIN 13,21 AT 33
690  HLIN 13,21 AT 34
700  HLIN 13,21 AT 35
710  HLIN 13,21 AT 36
720  HLIN 13,21 AT 37
730  HLIN 15,19 AT 38
740  HLIN 16,18 AT 39
745  COLOR= 0
750  PLOT 15,30
760  PLOT 19,30
770  PLOT 14,33
780  PLOT 15,34
790  PLOT 16,35
800  PLOT 17,36
810  PLOT 18,35
820  PLOT 19,34
830  PLOT 20,33
850  GOTO 350
900  COLOR= 0
910 X = 0
920  FOR T = 1 TO 40
930  HLIN 0,39 AT X
940 X = X + 1
950  NEXT T
960  RETURN
9989  REM  CONTROL L
```

```
9990  REM
9991  REM
9992  REM   SPECIAL EDUCATION
9993  REM    SOFTWARE CENTER
9994  REM
9995  REM     SUBROUTTINES:
9996  REM
9997  REM
9998  REM
9999  REM
10000  REM **********************
10001  REM
10002  REM  INITIALIZE ECHO II
10003  REM
10004  REM **********************
10005  REM
10010 VD$ =  CHR$ (4):VE$ =  CHR$ (5)
10020  PRINT VD$"BRUN TEXTALKER.RAM"
10030  PRINT VE$"0": REM  VOICE OFF
10040  TEXT : HOME : REM  CLEAR SCREEN
10050  PRINT VE$"B": REM  VOICE ON
10060  PRINT V$: REM  SAY TITLE
10070  RETURN
10080  FOR V0 = 1 TO 100: NEXT V0
10090  RETURN
10099  REM  CONTROL L
10100  REM **********************
10101  REM
10102  REM  TURN VOICE OFF
10103  REM
10104  REM **********************
10105  REM
10110  PRINT VE$"0"
10120  RETURN
10997  REM
10998  REM
10999  REM  CONTROL L
11000  REM **********************
11001  REM
11002  REM  INITIALIZE BIG
11003  REM  NUMBER, SINGLE
11004  REM  SWITCH SCANNING
11005  REM
11006  REM **********************
11007  REM
11010  DIM VX$(9): DIM VY$(9)
11020 VX$(0) = "DCBAAAAABCDEEEEE"
11021 VY$(0) = "7776543211123456"
11022 VX$(1) = "BCCCCCCBCD"
11023 VY$(1) = "7765432111"
11024 VX$(2) = "ABCDEEDCBAABCDE"
11025 VY$(2) = "677765443211111"
```

```
11026 VX$(3) = "ABCDEEDCEEDCBA"
11027 VY$(3) = "67776544321112"
11028 VX$(4) = "DCBAABCDEEEEEEE"
11029 VY$(4) = "765433337654321"
11030 VX$(5) = "AABCDEEEDCBAABCDE"
11031 VY$(5) = "65555432111277777"
11032 VX$(6) = "DCBAAAAABCDEEDCB"
11033 VY$(6) = "7776543211123444"
11034 VX$(7) = "ABCDEEEDDCC"
11035 VY$(7) = "77777654321"
11036 VX$(8) = "DCBAABCDEEDCBAAEE"
11037 VY$(8) = "777654443211123 56"
11038 VX$(9) = "DCBAABCDEEEEEEE"
11039 VY$(9) = "777654447654321"
11040 VC = 1: REM  INIT BACKGROUND COLOR
11050  PRINT : INPUT "SCAN STEPPING INTERVAL? (20-300) ";VW
11060  IF VW < 20 OR VW > 300 THEN 11050
11070  RETURN
11099  REM  CONTROL L
11100  REM **********************
11101  REM
11102  REM  SCAN UNTIL GAME
11103  REM  BUTTON #0 IS PUSHED
11104  REM
11105  REM **********************
11106  REM
11110 VN = 1: REM  SELECTION IS RETURNED IN VN
11120 VC = VC + 1: IF VC > 14 THEN VC = 1
11130 VX = 0:VY = 39: REM  SCREEN LOCATION
11140  GOSUB 12000: REM  DISPLAY VN VALUE
11149  REM
11150  REM  WAIT VW FOR BUTTON PRESS
11160  FOR V0 = 1 TO VW
11170 V1 =  PEEK ( - 16287)
11180  IF V1 < 128 THEN 11210
11190  GOSUB 11300: REM  DEBOUNCE SW
11200  IF V1 > 127 THEN 11400: REM  BUTTON IS REALLY PRESSED
11210  NEXT V0
11220  REM
11230  REM  SHOW NEXT NUMBER
11240 VN = VN + 1: IF VN > VM THEN VN = 1
11250 VC = VC + 1: IF VC > 14 THEN VC = 1
11260  GOTO 11140
11270  REM
11300  REM  DEBOUNCE BUTTON
11301  REM
11310  FOR V2 = 1 TO VW / 5
11320 V1 =  PEEK ( - 16287)
11330  IF V1 < 128 THEN  RETURN
11340  NEXT V2
11350  REM  BUTTON HELD LONG ENOUGH
```

```
11360  RETURN : REM  V1 > 128
11370  REM
11400  REM  RETURN RESPONSE VALUE VN
11410  PRINT VN: RETURN
11999  REM  CONTROL L
12000  REM **********************
12001  REM
12002  REM  DISPLAY LARGE NUMBER
12003  REM    AT VX,VY
12004  REM
12005  REM **********************
12006  REM
12010  COLOR= VC: REM  BACKGROUND
12020  FOR V1 = VY - 8 TO VY
12030  HLIN VX,VX + 12 AT V1: NEXT V1
12040  REM  DRAW UP TO 2 DIGITS
12050 V4 = VX + 1
12060 V3$ =  STR$ (VN): COLOR= 15
12070 V2 =  VAL ( MID$ (V3$,1,1))
12080  IF  LEN (V3$) = 1 THEN V4 = VX + 4: GOTO 12200
12090  REM
12100  GOSUB 12300: REM  DRAW 10'S DIGIT
12110 V2 =  VAL ( MID$ (V3$,2,1))
12120 V4 = VX + 7
12130  REM
12200  GOSUB 12300: REM  DRAW 1'S DIGIT
12210  RETURN
12220  REM
12300  REM  DRAW ONE DIGIT
12310 V5 = V4 -  ASC ("A")
12320 V3 = VY - 1 +  ASC ("1")
12330 V1$ = VX$(V2):V2$ = VY$(V2)
12340  FOR VI =  LEN (V1$) TO 1 STEP  - 1
12350  PLOT V5 +  ASC ( RIGHT$ (V1$,VI)),V3 -  ASC ( RIGHT$ (V2$,VI))
12360  NEXT VI
12370  RETURN
12380  REM  CONTROL L
```

DEMONSTRATION PROGRAM OF VIDEODISC
SUBROUTINES USING VOICE AND VIDEO

Program is in Apple Basic.

```
]LIST

1  HIMEM: 35072
2  REM -  ABOVE LINE IS REQUIRED
     AS FIRST PROGRAM LINE
5  REM --------------------
6  REM
7  REM  DEMONSTRATION PROGRAM
8  REM
10 DN$ = "COAL MINER'S DAUGHTER"
20  GOSUB 20001: REM - INITIALIZE
      VOICE AND VIDEO
30  REM --------------------
200 FR% = 100:FD = 10.0
210 DT$ = "YOU SHOULD SEE TEXT FO
     R]THREE SECONDS,]THEN FRAME
     100 FOR 10 SECONDS."
220  GOSUB 20000
225  REM ---------------------
230 FR% = 30000:FD = 5.0:TD = 5.0

240 DT$ = "]YOU SHOULD SEE OLD AN
     D NEW TEXT]FOR 5 SECONDS,]TH
     EN FRAME 30000 FOR 5 SECONDS
     ."
250  GOSUB 20000
255  REM --------------------
260 FR% = 100:FD = 5.0:TD = 10.0
270 DT$ = "YOU SHOULD SEE JUST NE
     W TEXT]FOR 10 SECONDS,]THEN
     FRAME 100 FOR 5 SECONDS."
280  GOSUB 20000
285  REM ---------------------
290 FR% = 10000:FD = 5.0
300 DT$ = ")NOW, YOU SHOULD JUST
     HEAR TEXT, AND SEE FRAME TEN
      THOUSAND FOR 5 SECONDS."
310  GOSUB 20000
315  REM --------------------
320 FR% = 11000:FD = 10.0
330 DT$ = ")HERE IS FRAME 11000 F
     OR TEN SECONDS. YOU SHOULD J
     UST HEAR THIS TEXT AND NOT S
     EE IT."
340  GOSUB 20000
345  REM ---------------------
350 FR% = 0:FD = 5.0
360 DT$ = ")NOW, AFTER TEN SECOND
     S, YOU SHOULD HEAR THIS NEW
     TEXT AND SEE THE SAME FRAME
     FOR 5 MORE SECONDS."
370  GOSUB 20000
375  REM ---------------------
380 FR% = 12000:FD = 0:TD = 5
390 DT$ = "NOW, YOU SHOULD SEE TE
     XT FOR 5 SECONDS]THEN YOU WI
     LL SEE FRAME 12000]UNTIL YOU
      PRESS A KEYBOARD KEY."
```

```
400  GOSUB 20000
401  IF ZK$ <  > "" THEN  PRINT "
     VALUE OF PRESSED KEY: "; ASC
     (ZK$)
405  REM --------------------
410 FR% = 13000:FD =  - 30:TD = 1
     0
420 DT$ = "]THIS TEXT WILL BE DIS
     PLAYED]FOR 10 SECONDS.]FRAME
      13000 WILL BE DISPLAYED]FOR
      THIRTY SECONDS OR UNTIL A K
     EY IS PRESSED."
430  GOSUB 20000
431  IF ZK$ <  > "" THEN  PRINT "
     VALUE OF PRESSED KEY: "; ASC
     (ZK$)
435  REM --------------------
440 FR% = 14000:FD =  - 30:TD = 1
     0
450 DT$ = "]THIS IS THE SAME TEST
      AS THE]PREVIOUS TEST, BUT W
     ITH FRAME 14000."
460  GOSUB 20000
461  IF ZK$ <  > "" THEN  PRINT "
     VALUE OF PRESSED KEY: "; ASC
     (ZK$)
465  REM --------------------
470 FR% =  - 1:FD = 20:TD = 3
480 DT$ = "NOW, AFTER 3 SECONDS O
     F TEXT DISPLAY]THE SCREEN WI
     LL BE BLANK]FOR TWENTY SECON
     DS]THEN FRAME 15000 WILL SHO
     W]FOR 20 SECONDS."
490  GOSUB 20000
495  REM --------------------
500 FR% = 15000:FD = 20:TD = 20
510 DT$ = "."
520  GOSUB 20000
525  REM --------------------
530 FR% = 0:FD = 1
540 DT$ = ")NEXT, FRAME 16000 WIL
     L BE DISPLAYED]FOR 5 SECONDS
      WITHOUT TEXT."
550  GOSUB 20000
555  REM --------------------
560 FR% = 16000:FD = 5:TD = 5
570 DT$ = ""
580  GOSUB 20000
585  REM --------------------
590 FR% = 17000:FD = 5:TD = 3
600 DT$ = "]HERE IS TEXT FOR 3 SE
     CONDS,]AND FRAME 17000 FOR 5
      SECONDS."
610  GOSUB 20000
615  REM --------------------
620 FR% = 18000:FD = 10:TD = 10
630 DT$ = "?PICTURE 1:HERE IS A G
     RAPHICS FILE FOR 10 SECONDS,
     THEN FRAME 18000 FOR 10 SECO
     NDS."
```

```
640  GOSUB 20000
645  REM --------------------
650 FR% = 19000:FD = 5:TD = 5
660 DT$ = "?PICTURE 2:HERE IS A G
     RAPHICS FILE FOR 5 SECONDS,T
     HEN FRAME 19000 FOR 5 SECOND
     S."
670  GOSUB 20000
675  REM --------------------
680 FR% = 20000:FD = 6:TD = 6
690 DT$ = "]THIS IS THE END OF TH
     E TEST.]TEXT FOR 6 SECONDS,]
     AND FRAME 20000 FOR 6 SECOND
     S."
700  GOSUB 20000
705  REM --------------------
900  GOSUB 20002
910  END
19999  REM  (CONTROL L)
20000  GOTO 22100: REM  DISPLAY
20001  GOTO 21080: REM  INIT 48K
20002  GOTO 23110: REM  FINISH
20003  REM
20004  REM --------------------
20005  REM
20006  REM  SPECIAL EDUCATION
20007  REM  SOFTWARE CENTER
20008  REM
20009  REM  SUBROUTINES WRITTEN
20010  REM  BY WILLIAM ROSS
20011  REM  SRI INTERNATIONAL
20012  REM  SEPTEMBER 1985
20013  REM
20014  REM  THESE ROUTINES ARE
20015  REM  PUBLIC DOMAIN
20016  REM
20017  REM --------------------
20100  REM
20101  REM  THESE ROUTINES
20102  REM  REQUIRE THAT THE
20103  REM  FOLLOWING COPYRIGHTED

20104  REM  FILES BE COPIED ONTO
20105  REM  THIS DISK:
20106  REM
20107  REM
20108  REM  LD-V4000 DRIVER @8900
     .OBJ
20109  REM  (ALLEN COMMUNICATION)

20110  REM
20111  REM  TEXTALKER.RAM
20112  REM  TEXTALKER.OBJ
20113  REM  (STREET ELECTRONICS)
20114  REM
20115  REM --------------------
20116  REM  (CONTROL L)
```

```
21000  REM --------------------
21001  REM  INITIALIZATION FOR
21002  REM  LD-V4000 PLAYER,
21003  REM  ECHO+ SYNTHESIZER,
21004  REM  AND APPLE IIE.
21005  REM  SUB 20001
21006  REM
21007  REM  DN$=
21008  REM  "NAME OF LASER DISK"
21009  REM  CAUSES POWER & LOAD
21010  REM  REQUEST
21011  REM
21012  REM  DN$=""
21013  REM  CAUSES ONLY LOADING
21014  REM  OF SPEECH AND
21015  REM  VIDEO DRIVERS
21016  REM
21017  REM --------------------
21080 ZV% = 12: REM - ECHO VOLUME
     , 12 IS NORMAL
21090 TD = 3: REM - DURATION OF T
     EXT DISPLAY, SECS
21100 D$ =  CHR$ (4)
21110 E$ =  CHR$ (5)
21120 V$ =  CHR$ (20)
21130  PRINT D$"BRUN TEXTALKER.RA
     M
21140  PRINT E$;ZV%;"V": PRINT E$
     "B": REM - SET VOLUMN, TURN
     ON SPEECH
21150  PRINT D$"BLOAD LD-V4000 DR
     IVER @8900.OBJ"
21160  CALL 35072: REM  INSTALL L
     ASER DISK DRIVER
21170  PRINT V$"APPLE": REM - SHO
     W COMPUTER TEXT ON CRT
21180  TEXT : HOME : VTAB 10: IF
     DN$ = "" THEN 21600: REM - I
     F DISC NAME IS NULL, ASSUME
     DISK IS INSATLLED
21190  POKE  - 16368,0: REM  CLEA
     R KEYBOARD
21200  PRINT "PLEASE TURN ON THE
     LASER DISC PLAYER."
21210  PRINT
21220  PRINT "PRESS ANY KEYBOARD
     KEY WHEN DONE."
21230 ZT =  PEEK ( - 16384)
21240  IF ZT < 128 THEN 21230
21250  PRINT : PRINT "THANK YOU."
```

```
21260  PRINT V$"REJE"
21270  PRINT V$"REJE": REM  OPEN
     LASER DISC DRAWER
21280  POKE  - 16368,0: REM  CLEA
     R KEYBOARD
21290  HOME : VTAB 10
21300  PRINT "PLEASE INSERT THE L
     ASER DISC,"
21310  PRINT : PRINT "     ";DN$;"
     ,": PRINT
21320  PRINT "THEN CLOSE THE LASE
     R DISC DRAWER."
21330  PRINT
21340  PRINT "PRESS ANY KEYBOARD
     KEY WHEN DONE."
21350 ZT =  PEEK ( - 16384)
21360  IF ZT < 128 THEN 21350
21370  PRINT : PRINT "THANK YOU."

21380  HOME : VTAB 10
21390  PRINT "PLEASE WAIT ABOUT T
     EN SECONDS"
21400  PRINT : PRINT "FOR THE DIS
     C TO START."
21410  PRINT V$"INIT": PRINT V$"A
     UDIOFF"
21420  PRINT : PRINT "DISC IS REA
     DY."
21430  REM
21431  REM
21432  REM
21600  REM - EXIT INITIALIZATION
     ROUTINE
21610 ZP = 1: REM - ASSUME PREV C
     ONDITION WAS NON-TEXT MODE
21620  RETURN
21900  REM  (CONTROL L)
22000  REM ----------------------
22001  REM  STILL PICTURE
22002  REM  DISPLAY ROUTINE
22003  REM
22004  REM  SUB 20000
22005  REM
22006  REM  DT$=
22007  REM  "TEXT TO DISPLAY"
22008  REM
22009  REM  FN%=
22010  REM  VIDEO FRAME NUMBER
22011  REM
22012  REM  FD=
22013  REM  DURATION OF VIDEO
22014  REM  FRAME DISPLAY
```

```
22015  REM
22016  REM  ID=
22017  REM  DURATION OF TEXT
22018  REM  DISPLAY FOR SINGLE
22019  REM  MONITOR SETUP
22020  REM
22021  REM ----------------------
22022  REM
22023  REM
22090  REM - SELECT TEXT ACTION
22100 ZL =  LEN (DT$)
22110 ZC = 1:ZD = 1:ZH = 1: REM
     COLMN 1, DISP TEXT, HOME CRT

22120 ZO$ = "": REM - CLEAR TEXT
     OUTPUT LINE
22130  IF ZL = 0 OR TD <  = 0 THEN
     ZC = 1:ZD = 0:ZH = 1:ZT$ = "
     ": GOTO 22200
22140 ZT$ =  MID$ (DT$,1,1)
22150  IF ZT$ = "," THEN ZC = 2:Z
     D = 0:ZH = 0
22170  IF ZT$ = "?" THEN ZC = 2:Z
     D = 1:ZH = 0: GOSUB 22500: REM
      DISPL PIC FILE
22180  IF ZT$ = "]" THEN ZC = 2:Z
     D = 1:ZH = 0
22190  IF ZT$ = ")" THEN ZC = 2:Z
     D = 0:ZH = 0
22200  REM - SWITCH CRT TO APPLE,
      FIND FRAME
22210  IF ZH <  > 0 THEN  HOME
22220  IF ZD <  > 0 THEN  PRINT V
     $"APPLE"
22230  GOSUB 23000: REM - CHANGE
     VIDEO FRAME
22240  REM
22250  REM  DISPL AND SPEAK TEXT
22300  IF ZD <  > 0 THEN  PRINT E
     $"B": REM - DISPL AND VOICE
     TEXT
22310  IF ZD = 0 THEN  PRINT E$"T
     ": REM - SPEAK TEXT WITHOUT
     DISPLAY
22320  IF ZH <  > 0 OR (ZP <  > 0
      AND ZT$ <  > "?") THEN  TEXT
     : HOME : VTAB 10
22330  FOR ZC = ZC TO ZL
22340 ZL$ =  MID$ (DT$,ZC,1)
22350  IF ZL$ = "]" THEN  PRINT Z
     O$:ZO$ = ""
22360  IF ZL$ <  > "]" THEN ZO$ =
     ZO$ + ZL$
22370  NEXT ZC
```

```
22380  PRINT ZO$
22390  PRINT E$"B"
22400 ZO = TD
22410  IF ZD <  > 0 THEN  GOSUB 2
     2700: REM - PAUSE TO READ TE
     XT
22420  REM
22430  REM - SWITCH CRT TO LASER
     DISC
22440  PRINT V$"VIDEO"
22450  GOSUB 22800: REM - INTERPR
     ET FRAME DURATION
22460 ZP = 0: IF ZT$ = ">" THEN Z
     P = 1: HGR2 : HOME
22470 Z =  FRE (0): REM - CLEAN O
     UT OLD STRING STORAGE
22480  RETURN : REM - BACK TO MAS
     TER PROGRAM
22490  REM  (CONTROL L)
22500  REM ----------
22501  REM
22502  REM  LOAD AND DISPLAY PIC
     FILE IN HI RES PAGE 2
22503  REM
22504  REM ----------
22510 ZN$ = "": REM - GET FILE NA
     ME
22520  FOR ZC = ZC TO ZL
22530 ZS$ =  MID$ (DT$,ZC,1)
22540  IF ZS$ = ":" THEN ZC = ZC +
     1: GOTO 22600
22550 ZN$ = ZN$ + ZS$
22560  NEXT ZC
22600  PRINT D$"BLOAD ";ZN$;",A$4
     000"
22610  POKE  - 16302,0: REM - SW
     TO FULL SCRN
22620  POKE  - 16299,0: REM - SW
     TO PAGE 2
22630  POKE  - 16297,0: REM - SW
     PAGE TO GRAPHICS
22640  POKE  - 16304,0: REM - SW
     TO GRAPHICS MODE
22650  RETURN
22690  REM  (CONTROL L)
22700  REM ----------
22701  REM
22702  REM  0.1 SEC RESOLUTION TI
     MER
22703  REM
22704  REM ----------
22710 Z2 = Z0 * 10
22720  FOR Z1 = 0 TO Z2
22730  FOR Z3 = 0 TO 50: NEXT Z3
22740  NEXT Z1
22750  RETURN
22790  REM  (CONTROL L)
```

```
22800  REM --------------------
22801  REM
22802  REM  INTERPRET FRAME DURAT
     ION
22803  REM
22805  REM --------------------
22810 ZK$ = "": POKE  - 16368,0: REM
     - CLEAR KEYBOARD
22820  IF FD > 0 THEN ZO = FD: GOSUB
     22700: RETURN
22830  IF FD < 0 THEN 22900
22840  REM - WAIT FOR KBD PRESS
22850 Z5 =  PEEK ( - 16384)
22860  IF Z5 < 128 THEN 22850
22870 ZK$ =  CHR$ (Z5 - 128)
22880  RETURN
22900  REM  WAIT FOR TIME FD OR K
     BD PRESS
22910 ZO =  - 10 * FD
22920  FOR Z1 = 0 TO ZO
22930 Z5 =  PEEK ( - 16384)
22940  IF Z5 > 127 THEN ZK$ =  CHR$
     (Z5 - 128): RETURN
22950  FOR Z2 = 0 TO 42: NEXT Z2
22960  NEXT Z1
22970  RETURN
22999  REM (CONTROL L)
23000  REM --------------------
23001  REM
23002  REM  FIND NEW VIDEO FRAME
23003  REM
23004  REM --------------------
23010  IF FR% = 0 THEN  RETURN
23020  IF FR% < 0 THEN  PRINT V$"
     ABORT": PRINT V$"PAUSE": RETURN
     : REM - VIDEO OFF
23030  PRINT V$"DISPF"
23040  PRINT V$"FIND(";FR%;")"
23050  RETURN
23090  REM  (CONTROL L)
23100  REM --------------------
23101  REM
23102  REM  FINISH ROUTINE
23103  REM
23104  REM  SUB 20002
23105  REM
23106  REM --------------------
23110  PRINT E$"O": REM - SPEECH
     OFF
23120  PRINT V$"APPLE": PRINT V$"
     PAUSE"
23130  IF DN$ = "" THEN  RETURN
```

```
23140  PRINT V$"REJE": REM - STOP
       DISC
23150  PRINT V$"REJE": REM - EJEC
     T DISC
23160  PRINT E$"B": REM  - SPEECH
       ON
23170  TEXT : HOME : VTAB 10
23180  PRINT "PLEASE PUT AWAY THE
       LASER DISC,"
23190  PRINT "CLOSE THE DISC PLAY
     ER DRAWER,"
23200  PRINT "AND SWITCH OFF THE
     DISC PLAYER."
23210  PRINT E$"O": REM - SPEECH
     OFF
23220  RETURN

]
```

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